NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

North Platte, Nebraska
June 21-24, 1988

U.S. DEPARTMENT
OF
AGRICULTURE
SOIL
CONSERVATION
SERVICE

National Cooperative Soil Survey

North Central Soil Survey Conference Proceedings

Juno 21-24, 1988
North Platte, Nebraska

North Central Soil Survey Conference
North Platte, Nebraska
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AGENDA

1988 North Central Soil Survey Work Planning Conference
Holiday Inn - North Platte, Nebraska
June 21 - 24

Monday, June 20, 1988

5:00 - 7:00 p.m.	Early evening registration in Room 140, Holiday Inn - North Platte.

Tuesday, June 21, 1988

MODERATOR: Jim Culver, Soil Scientist

7:00 a.m.	Early morning registration - Room 140
8:00 - 9:00	General Session - Antelope Room Welcome and Introduction Jim Kirkman, Mayor of North Platte Ron E. Hendricks, State Conservationist, SCS Lavon Sumption, Director, University of Nebraska West Central Research & Extension Center Dayle Williamson, Executive Secretary, Nebraska Natural Resources Commission
9:00 - 9:30	Soil Operation Perspectives - Thomas Calhoun, Soil Scientist, Program Development 8 Management, Washington
9:30 - 10:00	Break
10:00 - 12:00	Committee 1 - "Development and Coordination of Soil Survey Data Bases" Work Session - Antelope Room Committee 2 - "Soil Interpretations" Work Session - Buffalo Room

MODERATOR: Dave Lewis, Agronomy Dept., Univ. of Nebr.

1:00 - 1:30	General Session - Antelope Room Geographic Information System - Don Rundquist Conservation & Survey Division, UNL
1:30 - 1:45	Iowa Experiences in Digitizing Soil Data - Tom Fenton, Agronomy Dept.. Iowa State University
1:45 - 2:00	Missouri Experiences in "GRASS" - Bruce Thompson - State Soil Scientist, Missouri
2:00 - 2:30	Research Nebraska Sandhills - Gary Hergert, West Central Research and Extension Specialist
2:30 - 3:OD	Break

Tuesday, June 21, 1988 (con't)

3:00 - 5:00	Committee 3 - "Soil-Water Relationships" Work Session - Buffalo Room
	Committee 4 - "New Packaging of Our Information" Work Session - Antelope Room
5:30 - 7:00	Social Hour -- Complimentary at Cedar Bowl - Touchdown Club, 1100 South Jeffers. North Platte

Wednesday, June 22, 1988

MODERATOR: Mark Kuzila, Research Soil Scientist, C&SD, UNL

8:00 - 8:30	General Session - Antelope Room National Soil Survey Center Staff Organization - Steve Holzhey, Assistant Director, Soil Survey Division.
8:30 - 9:30	Soil Conservation Service Session - Antelope Room NCR-3 Session - Buffalo Room
9:30 - 10:00	Break
10:00 - 12:00	Soil Conservation Service Session - Antelope Room NCR-3 Session - Buffalo Room

MODERATOR: Norm Helzer, Asst. State Soil Scientist, SCS, Lincoln

1:00 - 1:30	General Session - Antelope Room National Soil Survey Laboratory - Ron Yeck, Staff Leader
1:30 - 2:00	Nebraska Sandhills - Jim Swinehart - Geologist Conservation & Survey Division, UNL
2:00 - 2:30	Southern Regional Cooperative Soil Survey Conference Report - Darwin Newton, Chairman, Southern Regional Soil Survey Work Planning Conference
2:30 - 3:00	Break
3:00 - 5:00	Committee 5 - "Soil Correlation and Classification" - Antelope Room
	Committee 6 - "Landscape Analysis and Development of Map Units" - Buffalo Room
8:00	Buffalo Bill Rodeo, Wild West Arena, North Platte

Thursday, June 23, 1988

MODERATORS: Mark Kuzila, RSS, CASD, UN-L
Larry Ragon, Asst. SSS. SCS. Lincoln

7:30	Field trip - buses depart from Holiday Inn - North Platte. Nebraska Sandhills
9:oo	Arrive at the Rogers Ranch, Logan County Nebraska. Soils - Range - Plants - Scenic View - Dunes - Ranch Operation
12:oo	Box Lunch
1:00 - 1:45	Travel to Collier Ranch, Thomas County near the Dismal River. Geology
2:30 - 3:45	Travel to Custer County near Arnold, Nebraska and the South Loup River. Deep Loess
5:30	Arrive Holiday Inn - North Platte
7:oo - 9:oo	BBQ at the UNL North Platte Station

Friday, June 24, 1988

MODERATOR: Jim Culver, Soil Scientist

8:00 - 9:45	General Session - Antelope Room Committee Reports
9:45 - 1o:oo	Break
1o:oo - 11:00	Committee Reports
ll:oo - 12:oo	Conference Business Meeting
12 Noon	Adjourn

PARTICIPANTS

NORTH CENTRAL SOIL SURVEY CONFERENCE
June 21-24, 1988
North Platte, Nebraska

Base, Steve R.
Baumer, Otto W.
Belohlovy, Francis
Bigler, Rick
Brown, Larry
Buller, Louis L.
Bushue, Lester J.
Calhoun, Thomas
Culver, James R.
Fenton, T. E.
Fornter, Jim
Franzmeier, Don
Frederick, William E.
Gerber, Tim
Gerken, Jon C.
Gundlach, H-d
Harner, Rodney
Heil, Dennis
Helzer, No- P.
Holzhey, Steve
Huffman, K. K.
Jansen, Ivan
Johnson, Paul R.
Kuehl, Ronald J.
Kuzila, Mark S.
Last, Donald
Lemme, Gary D.
Lewis, Dave
Lockridge, Dale
Mapes, Donald R.
McCloskey, Joseph
McLeese, Robert
Miles, Randall J.
Minor, Paul E.
Mokma, Delbert L.
Newton, Darwin
Nielson, Robert
Oelmann, Douglas
Olson, Ken
Orr, Sam
Paetzold, Ronald
Pauls, Bill
Payne, Steve
Ragon, Larry
Ransom, M. D.
Ratliff, Larry
Ritchie, Alexander
Sanpson, Scott
Schlepp, Richard
Sinclair, H. Raymond
Smeck, Neil F.
Stelling, Don
Stroesenreuther, Neil W.
Swinehart, Jim
Thiele, James H.
Thompson, Michael
Tomes, L. A.
Tummons, Richard
Vogt, Kenneth D.
Warner, Margaret
Watts, Cleveland
Yeck, Ron
Zavesky, Larry D.

COMMITTEE ASSIGNMENTS

NORTH CENTRAL SOIL SURVEY CONFERENCE
June 21-24, 1988
North Platte, Nebraska

Committee 1 - Development and Coordination of Soil Survey Data Bases
James Crum, Chairman

Members
William E. Frederick, Vice Chairman
James L. Anderson
Francis Belohlovy
Louie L. Buller
Terence H. Cooper
James Crum
James R. Culver
Jon C. Gerken
Norman P. Helzer
William D. Hosteter
Dale Lockridge
Fred E. Minzenmayer
Robert D. Nielson
Douglas Oelmann
Steve Payne
William E. Roth
Richard Schlepp
Roger A. Swanson
James H. Thiele
Bruce W. Thompson
Margaret Warner

Committee 2 - Soil Interpretations
Keith Huffman, Chairman

Members
Bob Ritchie, Vice Chairman
Loren Berndt
Ricky Bigler
James A. Bowles
John C. Doll
A.R.

Committee 4 - New Packaging of our Information
Randy Miles, Chairman

Members

Dennis Heil, Vice Chairman
Frank L. Anderson
Sylvester C. Ekart
W. Richard Folsche
Steve Holzhey
Donald Last
Christine Leitzau
Gary D. Lemme
Joseph McCloskey
Steve Messenger
Randall J. Miles
Jerry A. Miller
Sam Orr
Gerald J. Post
Bill Pauls
Larry Ragon
Bill Roth
Richard H. Rust
Gary Steinhardt
Neil W. Stroesenreuther
L.A. Tornes
Earl E. Voss

Committee 5 - Soil Correlation and Classification
M.D. Ransom, Chairman

Members

Dick Base, Vice Chairman
Steve R. Base
Edward L. Bruns
Lester J. Bushue
Tim Gerber
Howard F. Gundlach
Milo Harpstead
Rodney Harner
Corneilius J. Heidt
Berman Hudson
Mask S. Kuzila
Doug Malo
Donald Rex Mapes
Donald D. Patterson
M.D. Ransom
H. Raymond Sinclair, Jr.
Neil E. Smeck
Michael Thompson
Kenneth D. Vogt

Committee 6 - Landscape Analysis and Development of Map Units
Ken Olson, Chairman

Members

Don Franzmeir, Vice Chairman
James G. Bockheim
Robert Darmody
Marvin L. Dixon
Erling E. Gamble
David F. Grigal
Roger Haberman
Herbert Holdorf
Paul R. Johnson
Ronald J. Kuehl
Patrick C. Merchant
Delbert L. Mokma
Ken Olson
Walter Russell
Stephen G. Shetron
David Smith
Carl Trettin
Larry D. Zavesky

Summary of Committee Charges'and Recommendations
(Refer to the detailed committee reports for background and discussion)

Committee 1.--Development and Coordination of Soil Survey Data Bases

Charge 1: What kinds of soil survey data bases will we need for mapping unit interpretation to support the long-range soil survey program beyond 1990? Consider the vast amount of soil fertility data and engineering test data available in state and private laboratories. Should some of this data be part of the soil survey data base?

Recommendation: The State Soil Survey Data Base (3SD) within each state should be the prime data base for map unit information. Soil Fertility data should not be a part of 3SD but should be retained as a separate but relational data base.

Charge 2: How should the soil survey data be stored and retrieved? Is there a need for state soil survey data bases to have a uniform formatted central core of data that can readily be accessed by adjacent states using the same soil series?

Recommendation: The data should be stored in a relational uniform data base. Priority should be given to each state getting their data on line and coordinated before a larger data bank is attempted.

Charge 3: Identify ways that encourage or enhance the exchange of data base information among NCSS cooperators.

Recommendation: One of the best ways to encourage data exchange is through the development of a common data dictionary. The dictionary that is a part of 3SD could be a starting point. Other suggestions include establishment of committees to query soil survey cooperators joint projects, and memos of understanding.

Charge 4: Identify the academic needs in computer science and related courses at the undergraduate and graduate level for students who wish to pursue a career as a professional soil scientist in our modern day technology. Goal is to provide guidance for curriculum and counseling of students.

Recommendation: A basic knowledge of computers is needed but more technical courses are probably more helpful than multiple computer science courses.

Committee 2.--Soil Interpretation

Charge 1: Discuss the soil property data that should be used in modeling (i.e., average, modal, a range). Where should the data come from (i.e., laboratory data, soil interpretation records, research)? What should the numbers used in modeling represent?

Recommendation: Modeling should be based upon groups of soil properties rather than a single property: SIR data is the standard reference but the source of values for SIR should be presented i.e., implied vs. derived. The numbers used for modeling should be the maximum hard data available.

Charge 2: The principles and techniques of making soil potentials is well documented: however. use is limited. Identify how to'enhance effective use of soil potentials. What degree and involvement and documentation is needed?

Recommendation: The NCSS should circulate status reports of soil potential studies (SPS) work to all states on progress, involvement, and type of SPS. Personal involvement of contractors, suppliers, etc. should be encouraged; however, questionnaires could be used for economic factors.

Charge 3: Row csn survey data be related to water quality? Relisble soil pedon data extends to a depth of about two meters. How do we relate this data to the often much thicker geological material in evaluation of nitrate and other contaminates to groundwater?

Recommendation: All soil properties important to water movement and water quality should be identified and interpreted. Soil maps and soil survey texts need to be used along with stratigraphic data for water quality studies.

Charge 4: Discuss the academic training needed for making soil interpretations by students whobecome soil sclentlets. Relate the need for basic science (i.e., math, chemistry, physics, engineering) in providing a technical background to make quality soil interpretations.

Recommendation: A balanced curriculum of soil science courses totaling a minimum of 15 semester hours should continue to be the basic technical undergraduate preparation. Soil science majors should be able to analyze, think independently, and solve problems.

Committee 3.-Soil-Water Relationships

Charge I: Review the International Committee recommendations on soil moisture criteria and evaluate the impact on classlflcatlon and interpretation of soils in the Midwest. Hake recommendations to ICOMAQ.

Recommendation: No changes are needed in the definition of aquic moisture regime.

Charge 2: Discuss the applicability and acceptability of using the soil-water states as given in the National Soils Handbook in field operations and soil survey publications.

Recommendation: Field testing should be encouraged and soil moisture state observations included in soil survey reports on a trial basis.

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Charge 3: Review the definitions of soil moisture control section in Soil Taxonomy.

Recommendation: Use a fixed depth control section to evaluate existing moisture data and to test the suitability of soil-property-dependent soil water balance models to predict soil moisture regime.

Committee 4.--New Packaging of Our Information

Charge 1: Indicate major areas of interpretation needs and data needs for the next 10 years.

Recommendation: Major areas of interpretation needs for the next 10 years include: groundwater pollution potential, hazardous waste disposal potential, reliable crop yield data, woodland and wildlife suitability potential, soil compaction potential and properties relative to various tillage, planting and harvesting equipment, and soil conservation needs.

Data needed to make sound Interpretations in the next 10 years include: water table studies, through-flow of water In various soil landscapes, woodland and range site index, crop yields, Atterberry limits, available water holding capacity, bulk density, permeability, and soil adsorption potential,

Charge 2: Examine current trends and future needs in dissemination of soil survey information to users.

Recommendation: There is a need to communicate with soil survey users to recognize what information they need and in what form It is needed. The computer was identified by all committee members as the media of the future to disseminate information.

Charge 3: Discuss the alternatives of packaging the soil maps and interpretations for modernizing older soil surveys. What kind of soil maps will the user need (i.e., aerial photography base, computer generated map)?

Recommendation: Many users will continue to use the soil map published on photographic base maps but digitized maps will be used by an increasing array of groups. A comprehensive educational program will be needed to educate users.

Committee 5.--Soil Correlation and Classification

Charge 1: Consider proposed revisions for mineralogy classes in Soil Taxonomy. Consider revisions proposed for definitions of the control section for determination of the particle size classes. Respond to issues raised by the National Task Force on Soil Family Category that was part of the 1987 National Soil Survey Conference.

Recommendation: Further study of this charge is needed and should include communication and coordination of effort between Committee 5 and ICOMFAM.

Charge 2: Reach a consensus as to the continued use of variants in soil correlation.

Recommendation: The use of variants in soil correlation should be discontinued.

Charge 3: Develop guidelines for application in establishing the geographic range of soil series. Develop guidelines on when to establish new series as a result of items such as changes in soil moisture or soil temperature. When should a taxadjunct be used? When should the geographic range of a series be extended?

Recommendation: New soil series should be established whenever the interpretation becomes significantly different as the geographic range of a soil series is expanded.

Charge 4: Develop minimum soil correlation and classification requirements for modernizing old soil surveys. Discuss any need for a greater amount of transect data, pedon descriptions and laboratory data in field mapping of modernizing soil surveys as compared to the information needed for present soil correlation. How do we utilize older data in soil correlation updates?

Recommendation: The same technical requirements and standards used for current progressive soil surveys should also be applied to updates of existing soil surveys.

Committee 6.--Landscape Analysis and Development of Map Units

Charge 1: Discuss landscape components of map units (consociation. complexes association, undifferentiated) as they relate to making soil interpretations and for geographic information systems. Give priority to effect of landscape components on erosion relationships, crop productivity, and wetland assessment.

Recommendation: Soil scientists should develop block diagrams which show the relationship between landscape position, soil series and parent material. We recommend the supplementing of existing soil survey report data with landscape information. These supplemental reports could be developed for a soil association map or by major land resource area. Individual states should consider developing such a map product.

Charge 2: Develop guidelines for describing the landscape characteristics of map units at various scales. Include terminology, illustrations and definitions of terms for use in soil map unit descriptions.

Recommendation: The glossary of landform and geologic terms should be utilized when mapping and writing soil survey manuscripts.

Charge 3: Discuss the impact of landscape analysis used in models such as the Water Erosion Prediction Project (WEPP). Relate items such as length and shape of slope, erosion and accumulation or deposition of sediments to WEPP. Can we develop information for map units that will satisfy the needs of WEPP?

Recommendation: Soil survey reports should include additional landscape information (such as position, slope length and slope shape) in soil map unit descriptions, in tables, on maps and in figures.

Charge 4: Illustrate how map units based on landscapes might be interpreted for different purposes. This will enable others to better comprehend who the audiences might be and indicate some of the ways in which the information can be used.

Recommendation: We suggest any future mapping efforts include increased emphasis on landscape considerations which could improve the interpretational potential of soil surveys. We need to keep improving our map product. We recommend that our Committee 6 (Landscape Analysis) be combined with Committee 2 (interpretations) since much of the landscape information needed is for various interpretations.

Minutes of Soil Survey Conference

NORTH CENTRAL SOIL SURVEY CONFERENCE

North Platte, NE

June 21-24, 1988

Minutes of the General Session and Business Meeting

The 1988 meeting of the North Central Soil Survey Work Planning Conference was called to order by Chairman Jim Culver at 8:00 a.m.. June 21. The conference members were welcomed and introduced to Nebraska by Jim Kirkman, Mayor of North Platte; Ron E. Hendricks, State Conservationist, Soil Conservation Service; Lavon Sumption, Director, University of Nebraska, West Central Research and Extension Center; Dayle Williamson, Executive Secretary, Nebraska Natural Resources Commission.

Committee work sessions were conducted on Tuesday, Wednesday p.m., and Friday a.m. The work sessions were interspersed with presentations by individuals on various topics. The reports of individuals making presentations are noted on the agenda and a summary of their presentations is included in the conference proceedings. A well-planned, interesting field trip to the Nebraska Sand Hills was held on Thursday. Wednesday morning the Soil Conservation Service and NCR-3 group met in separate sessions. A barbecue was held at the University of Nebraska North Platte station on Thursday evening. A brief description of the committee reports as presented on Friday morning by the chairman of the respective committees is listed in the following paragraphs.

Committee 1: Development and Coordination of Soil Survey Databases.

Committee 2: Soil Interpretations.

Committee 3: Soil Water Relationships.

Committee 4: New Packaging of Our Information.

Committee 5: Soil Correlation and Classification.

Committee 6: Landscape Analysis and Development of Map Units.

committee 1

Vice-chairman Frederick summarized the discussion of the committee meeting. The merits of including fertility data as a part of 3SD were discussed by the entire group. The group felt fertility data should be retained as a separate but relational data base. A motion to accept the report and that the committee be continued was made by Rod Harner and seconded by Randy Miles. The motion carried.

Committee 2

Chairman Hoffman expressed thanks to Vice-chairman Ritchie and then reviewed the committee's discussion. It is recommended that Soil Interpretation become a standing committee. Also, the committee made recommendation for changes for the 1990 conference. A motion to accept the report was made by Richard Tummons

Randy Miles, chairman of the NCR-3 group. announced the following committee appointments:

Soil Taxonomy Committee: Mickey Ransom

Elected to attend the next national soil survey work planning conference to be held in Lincoln, NE: Tom Fenton and Dave Lewis

Selected to represent the NCR-3 group at the national soil characterization data conference: Tom Fenton

Ron Harner announced that Ken Vogt would be the newly-elected SCS representative on the Soil Taxonomy Committee.

Tom Fenton announced that the next work planning conference scheduled for 1990 would be held in Ames at about the same time of year but probably the early part of June.

Rick Bigler, acting for Dennis Heil, extended an invitation to the work planning conference to come to Minnesota in 1992. Keith Huffman made a motion that we accept the invitation from Minnesota. Del Mokma seconded the motion. The vote was unanimous to accept the Minnesota invitation.

Sam Orr expressed a concern about the availability of information concerning soil scientists or potential soil scientists that would be available for employment and their qualifications for employment as soil scientists. He would like to initiate a survey, perhaps starting in the North Central Region, to determine the number of soil scientists available in the near future. It was pointed out that many agronomy departments do not specify soils as a major. Sam agreed to prepare a questionnaire and send it to Jim Culver so that the number of potential employers in the North Central Region, or perhaps in the United States, could be determined. Tom Calhoun stated that the Soil Conservation Service is presently trying to obtain premium pay for beginning soil scientists. A motion was made by Keith Huffman that Sam prepare the worksheet and send it to Jim Culver. The motion was seconded by Don Patterson. The vote was unanimous to approve the motion.

Norm Helzer presented a resolution relative to the Blowout Penstemon which we were introduced to on our field trip. It is a" endangered species and the resolution follows: The North Central Soil Survey Work Planning Conference supports the effort to repopulate Blowout Penstemon into native habitat. Blowout Penstemon (Penstemon haydenii) is a" endangered species. Acronym S.H.A.R.P. (Sand Hills Area for Regional Progress) is a nonprofit organization in Stapleton, NE, and is encouraging youth organizations to voluntarily help repopulate native habitat (Blowouts in the Nebraska Sand Hills) with potted plants of Blowout Penstemon. S.H.A.R.P. is seeking funding so as to encourage volunteer youth organizations with prizes, awards, prize money, etc.

Contact person: Sue Stickney, H.C. 35, Box 37. Tryon, NE 69167.

The resolution was put in the form of a motion by Dave Lewis and was seconded by Del Mokma. The vote was unanimous to support the motion.

Rod Harner explained the workings of the National Soil Survey Quality Assurance Staff and introduced Larry Ratliff as a new member of that committee. Rod also expressed thanks to Jim Culver and his staff for the fine meeting and accommodations at North Platte.

Steve Holzhey, acting in his new position as assistant director of the National Soil Survey Center, reflected on how soil survey has changed since he started with SCS 30 years ago. He reviewed the trends in funding and expressed the opinion that soil survey was in good shape for entering the 1990s. He also expressed his thanks to the hosts for a well-conducted meeting.

A motion for adjournment of the Work Planning Conference was made by John Nixon and seconded by Lou Buller. The motion was unanimously approved.

Respectively submitted
T. E. Fenton, Secretary

NCR-3
June 22, 1988
North Platte, NE

Chair: Dr. R. Miles
Secretary: Dr. G. Lemme
NCR-3 rep at SCS meeting: Dr. K. Olson

ATTENDANCE

NAME	INSTITUTION
* Randy Miles	Univ. of Missouri
* Gary Lemme	South Dakota State Univ.
* Don Franzmeier	Purdue Univ.
* Mickey Ransom	Kansas State Univ.
Tom Calhoun	Soil Conservation Service
Steve Holzhey	Soil Conservation Service
Michael Thompson	Iowa State Univ.
* Neil Smeck	Ohio State Univ.
Tim Gerber	Ohio Dept. of Natural Resources
Jim Bowles	Univ. of Wisconsin-Stevens Point
Mark Kuzila	Univ. of Nebraska
* Dave Lewis	Univ. of Nebraska
# Robert Gast	Michigan State University
* Don Patterson	North Dakota State University
* Delbert Mokma	Michigan State University
* Ivan Jansen	Univ. of Illinois
Don Last	Univ. of Wisconsin-Stevens Point
• Tom Fenton	Iowa State Univ.
Ken Olson	Univ. of Illinois

• state NCR 3 representative
administrative advisor

A. NEW BUSINESS

1. National Soil Survey Center (NSSC)

Steve Holzhey, director of the NSSC discussed the need to build a strong network between the NSSC and the experiment stations. Steve indicated that the NSSC would be interested in participating in grant proposals with experiment stations. This may work out well with the national soil survey laboratory.

2. FY89 federal budget (presented by Robert Gast)

The House and Senate CSRS budgets have a 2 million and 4 million special grants item respectively for water quality related research.

3. FY90 federal budget (presented by Robert Gast)

The competitive grants section of the CSRS budget may contain a roil science section for the first time.

4. Formation of a NCT

Dr. Gast suggested that NCR 3 consider linking water quality issues and soil survey information. The discussion pointed out that lots of data exists but is not summarized. It was agreed that those states interested in developing a regionalized summarization of their water table data should bring their information to the 1959 NCR 3 meeting. Time will be set aside at the end of the meeting for those interested. The group did not think setting up an NCT would facilitate our efforts beyond what could be accomplished in the existing NCR 3 structure.

5. Regional Taxonomy Committee

Mickey Ransom volunteered to serve a three year term on the committee to replace Gary Lemme whose term expires July 1. Our representatives and their graduation dates are as follows: Ivan Jansen (1989), Donald Franzmeier (1990) and Mickey Ransom (1991).

6. NCR 3 1969 secretary

Fenton moved/Ransom seconded Neil Smeck's nomination Motion carried.

7. National Soil Survey Workplanning Conf.

Dave Lewis and Tom Fenton volunteered to represent NCR 3. Tom Fenton and Jerry Miller of Iowa State Univ. volunteered to serve on the 1989 steering committee. The 1990 regional work planning conference will be held in Iowa.

5. National laboratory database meeting

Tom Fenton volunteered to represent NCR 3 the week of July 25, 1985 at the meeting and report back to the group in 1989.

9. NCR 3 extension

Application is due by Feb. 1989 so NCA 9 can evaluate the application. Gary Lemme and Randy Miles will prepare our application for extension.

10. 1959 NCR meeting

June 19 noon through noon June 20, 1959 in Indianapolis, IN. Don Franzmeier will make arrangements.

11. Gerhert Lee's retirement

Dr. Gerhart Lee will be retiring from the Univ. of Wisconsin-Madison this summer. The group would like to acknowledge Dr. Lee's contributions to soil science and NCR 3.

B. OLD BUSINESS

1. Regional map

Tom Fenton lead a discussion on proposed map unit additions and revisions. He will compile and distribute a new map legend with the revisions. The map is coming along well.

Respectfully submitted:

Gary D. Lemme

Gary D. Lemme, Secretary

NORTH CENTRAL SOIL SURVEY CONFERENCE
Session for Federal and State Agencies
June 22, 1988
Rodney Harner, Chairman

Representatives of federal and state agencies met from 8:30 a.m. to noon. The following is a summary of items covered during this session.

National Soil Survey Quality Assurance Staff
Rod Harner, National Leader

Technical quality assurance is the function of working with state conservationists (STCs) to assure that the STCs and their staffs have the knowledge, technology, information, standards, procedures, and processes necessary to perform technical functions and technical quality control, which are the responsibility of each STC. Technical quality assurance is accomplished primarily through state technical appraisals, through reviews of project proposals and plans, and review of technical material8 such as soil correlations, soil series descriptions, and soil survey manuscripts.

NATIONAL BDLLETIN NO. 430-S-5, Soil Correlation Process, December 1, 1987, emphasized four major changes:

1. The NTC correlation function has been centralized into one national staff. The primary role of the National Correlation Staff will be to provide training, guidance, and technical oversight to states and to coordinate correlations across state lines. Work area8 will be assigned by major land resource regions.

2. State soil scientists will approve and sign correlation memoranda.

3. State conservationist8 will sign cover letters transmitting correlation memoranda. This letter will state that the soil survey and the correlation have been completed according to National Cooperative Soil Survey Standards.

4. Correlation activities are performed during each field review for areas mapped since the last review.

Quality assurance will be carried out through the following functions:

FUNCTION: Review memorandum of understanding.

Emphasis Items

- Purpose of the soil survey
- Guidance on soil survey procedure8
- Average size of management unit
- Maximum size of contrasting inclusions
- Map scale

- Schedule for completion

FUNCTION: ...ate in initial field review or early progress review.

Emphasis ___

- General soil map quality
- Accuracy of interpretations
- Adequacy of special investigations
- Status of soil interpretation records
- Classification and use of laboratory data
- Status of manuscript
- Matching of maps with adjoining soil surveys

FUNCTION: Review of draft of final correlation.

Emphasis Items

- laming of map units
- Problems and deficiencies noted at final field review

FUNCTION: Training.

Emphasis Items

- Basic soil survey course
- Soil correlation course
- Workshops for state soils staffs
- Participation in state workshops
- Training of individuals
- Training during field reviews
- Development of training aids and modules

The emphasis will continue to be progressive soil correlation. During each field review the taxonomic units and map units recognized since the last review need to be reviewed and approved. With progressive correlation map compilation and development of the soil survey manuscript can be done concurrently with mapping.

The Rational Soil Survey Quality Assurance Staff will make its input early in the survey, beginning with a critical review of the memorandum of understanding. A soil scientist will be assigned to review the memorandum of understanding, participate in field reviews, and follow the survey through correlation. It is essential that staff members participate in the initial field review or an early progress review. If the state does an adequate job of legend development and progressive correlation, the final field review can be held as much as 1 year before the completion of mapping. A draft of the correlation is to be prepared by the state at the final field review. This draft is circulated for review by cooperators and the BSSQA Staff. When mapping is complete, the final correlation document is prepared and approved by the state soil scientist.

NATIONAL BULLETIN NO. 430-8-10, Soil Survey Manuscripts and Texts, February 17, 1988 emphasizes that coordination of soil survey maps and manuscript text is the responsibility of the state. Soil survey manuscripts that have been edited for technical accuracy are due into the National Soil Survey Quality Assurance Staff 90 days after the correlation report is signed. If a state wants a technical review of manuscript sections by NTC specialists, other than soil specialists, the state needs to arrange for such a review with the NTC. This needs to be done before the manuscript is submitted to the National Soil Survey Quality Assurance Staff for review.

Processing Soil Series Descriptions

Louie L. Buller

NATIONAL BULLETIN NO. 430-8-g distributed the procedure for processing series descriptions for inclusion in the Official Series Description (OSED) file. The bulletin was written when the OSED file was at the Washington Computer Center and needs revising now that the OSED file is at Iowa State University.

Three important changes brought about by this bulletin are:

1. Series descriptions are submitted by the states to the Soil Survey Quality Assurance Staff on AT&T 3B2 diskettes for processing.

2. States will transmit soil interpretation record changes directly to Ames.

3. States will maintain an information file containing a log of revisions made to official soil series.

When the OSED file was moved to Ames, Iowa, it was linked with the Soil Classification (SC) file. With this link in place, information on the SC file will no longer also be stored in the OSED file and consequently eliminate conflicting information.

The series description submitted to the OSED file is used to make classification changes in the SC file. When the two files where linked, we found discrepancies between the two files that had to be resolved. The discrepancies were primarily series that had been established through correlation and the SC file had been updated to show established series but the series description in OSED was still tentative. The states were sent a list of these series and asked to submit a revised description with established states.

The National Soil Survey Quality Assurance (NSSQA) Staff is setting up a communications network for transmitting revised series descriptions and other files to the NSSQA Staff and to other states. The network existing UNIX communications capabilities on the 3B2 and uses the 3B2 in the NSSQA Staff as a hub for the network.

Soil Correlation
Dick Base

When the NSSQA staff is scheduled to participate in an initial field review or a progress field review, the following materials need to reach the NSSQA staff at least 2 weeks prior to the review:

1. Taxonomic unit descriptions

2. Map unit descriptions

3. Identlflcatlon legend

4. Itinerary for review

The following material is needed in the NSSQA staff at least 30 days prior to a final or comprehensive field review:

1. Soil survey manuscript (including interpretative tables)

2. Laboratory data from labs other than from NSSL

3. Paper copy of current SOI-6 file

Soil Surveys for FSA
Jim Culver

FSA - Soil Interoretstlon

There continues to be a need to maintain a good cooperative coordination input within and between states on highly erodlble lands (HEL) and hydrlc soil mapping units in our field office technical guides. The MNTC plans to request assistance from the Midwest states in making a review on the coordination HEL and hydrlc soil mapping units of selected published soil surveys along state lines. One county along each adjacent state will be used in making a general review of our interstate soil interpretative coordination of soils for FSA requirements.

FSA - Field Mapping

Excellent progress is being made in preparing soil maps to meet the requirements of PSA. However, large acreages of soil surveys remain to be made prior to December 1990. Six states collectively have over 20 million acres of cropland to map. These include North Dakota (7.5 million acres); Minnesota (4.8 million acres); Missouri (3.0 million acres); Illinois (2.0 million acres); South Dakota (1.5 million acres); and Wisconsin (1.5 mllllon acres). The states of Iowa, Michigan, Nebraska, and Ohio collectively have slightly over 1 million acres of soil surveys to be made on cropland. Soil maps are available in Kansas and Indiana to meet the minimum requirements of FSA.

The states of North Dakota, Minnesota, Illlnols, and Missouri have soil scientists on detail during the field mapping season to accelerate acreage production. It appears that a rather large detail of field soil scientists to these states will be needed to complete the field mapping of all cropland in 1990.

STATSGO
The National Cartographic Center has monies this fiscal year to contract the digitizing of our state STATSGO maps. This is en opportunity for those states with maps end legends near completion to move ahead.

Digitizing Soil Surveys

Donnel L. Stelling
National Cartographic Center

This morning I will address some of the activities at the National Cartographic Center and talk about some of the digitizing efforts that are going on in the states.

The National Cartographic Center has been involved in the GRASS pilot project to evaluate GRASS. The acronym GRASS stands for 'Geographical Resource Analysis Support System". Seven states were selected as pilot test sites for GRASS. The states are Colorado, Vermont, Missouri, Oklahoma, Washington, Michigan, New York and also the National Cartographic Center. Each of the states sent representatives to the National Cartographic Center for training. Most of these states have completed their analysis of the GRASS system and submitted a report to National Headquarters. Comments from the states are being consolidated prior to completing the final report on the GRASS system.

The NCC recommends that the Kurta digitizers be replaced with a backlighted digitizer table similar to an Altek or Calcomp digitizing table. The reason for this is that without a back-lit digitizing table, it is extremely hard to see pencil lines in vegetated areas. Eye strain is a common problem if the photo image obscures the pencilled soil lines.

At this time GRASS is not a practical system for digitizing soil surveys. The National Cartographic Center is doing some further evaluation of the system and we hope to have improved software by late this fall available to test GRASS as a means of digitizing soil surveys.

The NCC is testing ARC/INFO on two different systems. One system is the stand alone AT&T 6300. Other testing is being done on the SNTC Data General mini-computer where we are doing on-line digitizing and map processing. We are planning to procure a Sun system with ARC/INFO in FY-89.

ARC/INFO is marketed by Environmental Systems Research Institute (ESRI). ESRI has provided training to 15 SCS personnel at the South NTC of which 11 were on the NCC or Remote Sensing Staffs and four were on the South NTC or NHQ CGIS staffs. An additional four people from the South NTC and eight people from states have received training on ARC/INFO digitizing and GIS from the NCC staff. At the present time, we are unable to interface the ARC/INFO Data General with our Gerber photoplotter. This will be a requirement if we are to use ARC/INFO to generate final cartographic products for NCSS publication. We have issued a contract to ESRI to develop software that will permit us to interface the ARC/INFO with the Gerber plotter.

Using inexperienced people we have found a complex quad requires approximately 125 hours for soil digitizing. This of course, is going to vary greatly across the country with some of the soil detail in North Carolina being the most detailed information we have been involved in, and soils overlays in Nevada and Utah being examples of the less congested quadrangles.

A forerunner of the STATSGO project is the Nebraska 1:250,000 project which Jim Culver initiated. The status map at the end of this report shows the status of STATSGO.

Several states are using variations of software and hardware to experiment with map finish digitizing. To date no one has come up with a system that will either generate a set of publication negatives or permit the NCC to receive tapes from the state to generate the final negatives on our Gerber plotter in ready to publish form. The software required to generate a final product with soil symbol type would be very expensive and probably beyond the capability of most of the systems that are in the states today. Improvements are continually being made. At the present time the NCC is advocating that states do the digitizing and either furnish us with a clear film positive of the soil polygons or provide us with a tape so we can generate the soil polygons on our Gerber plotter, The NCC will then contract for type placement and manual compilation scribing of roads, intermittent drainage and other culture features.

If states are planning to procure a digitizing system in the near future, the NCC suggests that states consider PC ARC/INFO for field office use along with the PC starter kit, PC ARC edit and PC ARC plot for initial GIS work. These modules constitute a basic GIS. ARC edit performs digitizing, coordinate conversion and attribute editing capabilities. ARC plot creates cartographic products. Although this is a minimum of GIS software it will provide commonly required GIS tables at about one-half the cost of a full system. The ARC/INFO software on the PC 6300 has performed and meets our expectations for GIS and map digitizing.

As previously mentioned we plan to have updated software for GRASS this fall but are uncertain how the digitizing package will perform.

Many of you have heard the term "rubber sheeting". For the most part, rubber sheeting is still considered to be in the development stage from what we have seen. Several vendors claim to have the capability to provide rubber sheeting services, but products that have been provided to date in other than extremely flat areas such as Florida, have not been totally satisfactory. Our recommendation would be that anyone that tries to use rubber sheeting for publication should proceed carefully before committing too much money towards the effort.

There has been a lot of discussion about the use of digital line graph data (DLG's) from USGS to substitute for manually compiled or scribed hydrographic features and cultural features. This too has not been without problems. Keep in mind first of all there is no guarantee that an orthdphoto will exactly superimpose on top of a topographic quadrangle map taking into consideration paper shrink and stretch. The photograrmnetric control used to generate orthophotography is frequently more refined and precise than control that was used to generate the topographic maps some years earlier. Be aware that DLGs are generated at the scales of 1:24,000. 1:100,000 and 1:2,000,000. It is unlikely that DLGs acquired from 1:100,000 digital data and certainly from 1:2,000,000 digital data will be accurate enough to use for 1:24,000 publication. We believe that if you plan to use DLGs to supplement or replace manually compiled and scribed data that you only use DLGs that are generated at 1:24,000 scale.

The National Cartographic Center will be playing an expanded role in contracting for digitizing. We plan to look into obtaining vendors who have the capability of scan digitizing as well as manual digitizing. We believe that scan digitizing is the way of the future if we are to be able to handle the volume of digital data required. As some of you are aware Iowa, Minnesota and Michigan have been active in scan digitizing the inked overlays that have been compiled since mid-1970's. As far as I know the digital data that is being scanned serves their purpose quite well for the way they are using the data for smaller segments of coverage such as one or two square miles. The scan digitizing these three states are doing is not for NCSS publication. The National Cartographic Center will be exploring scan digitizing with the idea that we want to work with larger blocks of data such as a full map sheet or full quadrangle and then have the capability to combine quadrangles and map sheets into a larger data base for the purpose of generating interpretations on a county or entire survey area basis. Scanning systems are still having problems handling colored ink or pencilled lines on top of a photo image. Overlays that have been inked or scribed work the best.

In summary, we have not seen either a manual or scan digitizing system that will turn out a complete cartographic product ready for publication.

Other reports pertaining to cartographic activities appear on the following pages.

REPORT ON MAP FINISH CONTRACTING
NATIONAL CARTOGRAPHIC CENTER
FORT WORTH, TEXAS

This report describes work that has been performed by the National Cartographic Center since June 1985, for NCSS map finish scribing. Seventeen states have participated in contracting for map finishing services through the NCC. Fifty-two survey areas have been contracted totaling 2,684 map sheets of which 407 of the map sheets were full quad format.. Total contract cost for these 52 surveys is $355,929.58 or an average of $6,844.72 per survey area. The average for map sheet is S132.61. The cost range is $53.44 per map sheet to as much as $529.37 per map sheet. The higher price range was for highly detailed soils and culture on a full quad format.

Most of the compilation received from the states is quite adequate for contract map finishing. Some is very well done, while others are poorly done and/or contain excessive errors. We can usually correct errors, missing symbols, soil lines, etc. by referring to the field sheets. However, poor quality work cannot be corrected efficiently. The poor quality compilation usually produces poorer quality maps at a higher cost. We pay contractors $2.00 each for authors errors. Authors errors are errors that are the responsibility of SCS.

MIDWEST REGION

NCSS ACTIVITIES
IN
NATIONAL CARTOGRAPHIC CENTER

1. CONTRACT MAP FINISHING

We do contract map finishing for 17 states.

States in the Midwest Region we contract map finishing for are Kansas and Ohio.

2. MAP COMPILATION PREPARATION

Map compilation material has been sent to the states for 55 survey areas in FY-88.

34 percent of these are in the Midwest region.
By state they are:

Illinois	6
Missouri	7
Ohio	1
Nebraska	1
South Dakota	1
Minnesota	2
Kansas	1
	19

3. SENT TO PRINTER

43 survey areas have been sent to the printer in FV-88.

37 percent of the surveys sent to the printer are from the Midwest region.
By state they are:'

Wisconsin	2
Ohio	1
Nebraska	2
North Dakota	1
Indiana	3
Minnesota	3
Iowa	1
Illinois	2
Michigan	1
	16

4. MAPS ON HAND

The NCC has on hand about 200 survey areas that are awaiting publication.

43 percent of these are in the Midwest region.
By state they are:

Iowa	B
Nebraska	3
Indiana	14
South Dakota	4
Illinois	17
Wisconsin	4
Kansas	6
Ohio	6
North Dakota	5
Minnesota	8
Missouri	9
Michigan	3
	87

5. IMAGERY ACQUISITION

- Field mapping imagery	$117,452.00
- Orthophotography for publication	$573,420.00
	$690,872.00

- Field mapping in Midwest region	$ 29,377.00
- Orthophotography in Midwest region	$127,340.00
	, .00

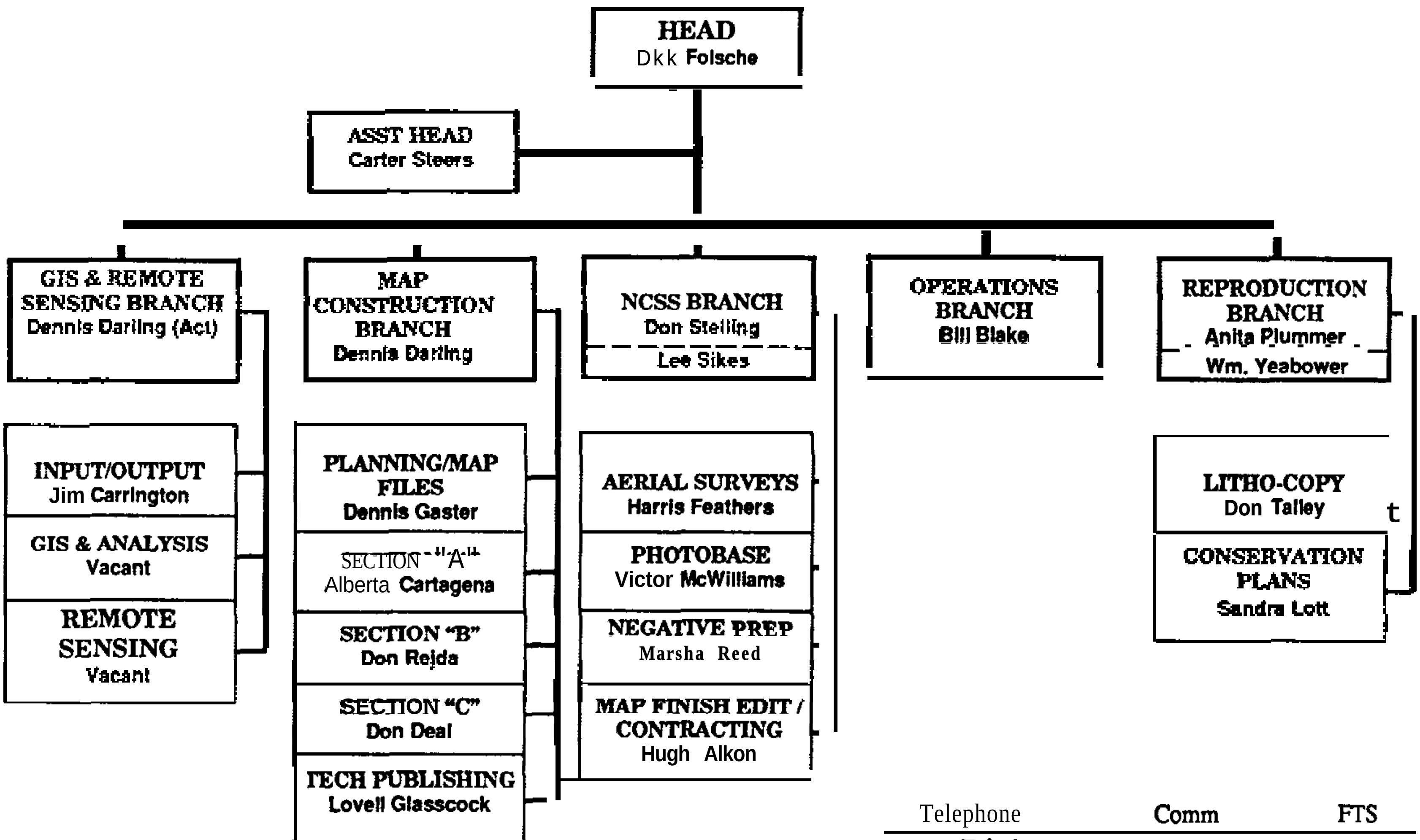
- 25 percent of total field mapping imagery cost is for Midwest region ($29,377).

- 22 percent of total orthophotography imagery cost is for Midwest region ($127,340).

- Imagery by state:

State	Mapping Imagery	Publication Imagery
IA	0	0
IL	0	0
IN	0	10,500
KS	1,179	33,020
MI	5,052	5,400
MN	0	0
		0
[illegible]	[illegible]	0
ND	0	
OH	0	7.200 0
SD	12,652	61,400
WI	0	9,820
Total	,	$127.340

National Cartographic Center



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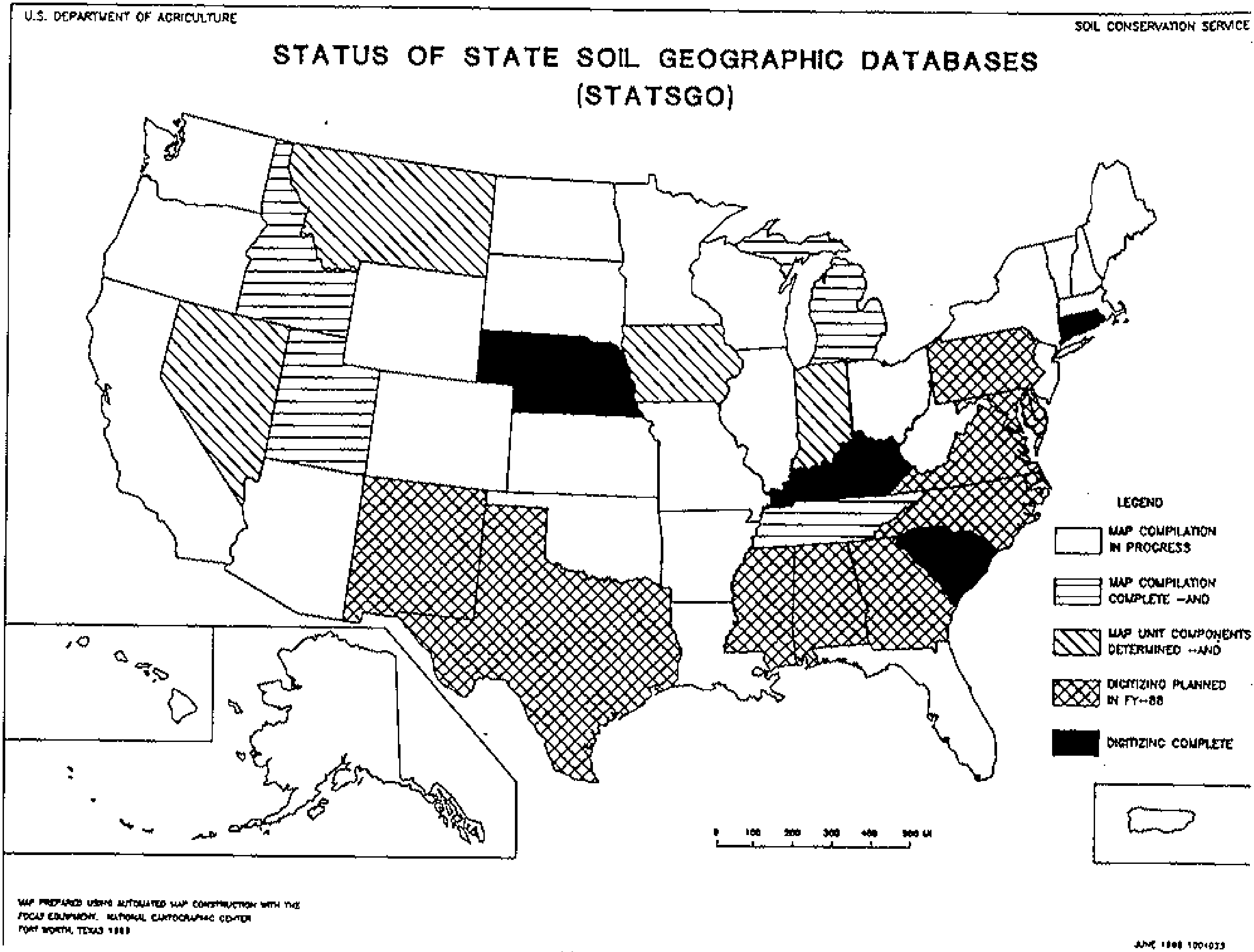
May 1988


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STATUS OF STATE SOIL GEOGRAPHIC DATABASES
(STATSGO)
LEGEND
MAP COMPILATION IN PROGRESS
MAP COMPILATION COMPLETE --AND
MAP UNIT COMPONENTS DETERMINED --AND
DIGITIZING PLANNED IN FY--88
DIGITIZING COMPLETE
0 100 200 300 400 500 MI
MAP PREPARED USING AUTOMATED MAP CONSTRUCTION WITH THE
FOCAS EQUIPMENT, NATIONAL CARTOGRAPHIC CENTER
FORT WORTH, TEXAS 1988

NATIONAL PERSPECTIVE

NATIONAL COOPERATIVE SOIL SURVEY

THREE PROGRAM EVALUATIONS

A. Grace Commission 1983

1. Concentrated in automating editing
2. Improved word processing capability
3. Coordinate directly with GPO
4. Staff for timely completion of surveys (5 years)
5. CASPUSS not a good management tool

B. Soil Survey Program Evaluation 1984-86

1. Prioritize soil survey activities to accomplish FSA
2. Expand technical services
3. Continue to work closely with cooperator8 in developing work plans
4. Be flexible on publication formats
5. Be more efficient
    a. Complete once over
    b. Equipment to accomplish job
6. Develop interactive data bases

C. Productivity Improvement Project 1986-87

1. Charged to find the most effective, efficient organization for accomplishing agency objectives in soil survey. Identify those activities which are governmental and those that could be considered commercial in nature
2. Classification, correlation, and interpretation functions should be done at state and field level where personnel have greatest knowledge about specific goals
3. Assign technical staff responsibility by MLRA
4. Establish NSSC

Prepared by Thomas Calhoun, Soil Scientist, Program and Budget Implementation, Soil Conservation Service, Washington, D.C.

5. Implement management initiatives (14) to improve efficiency

NCSS has improved automating editing
has improved word processing capability
is doing more project soil survey management
has developed a new soil survey scheduling system
has prioritized mapping of cropland to meet the needs of 1985 FSA
has expanded technical services

These items, coupled with major program lnltlatlves such as the 1985 FSA, water quality concerns, and completing the inventory of the nationals soil resources, form the core of the NCSS program.

Status of Soil Surveys on FSA Lands

When the 1985 Food Security Act was enacted, the SCS determined that 94 million acres of land in the United States needed soil maps for FSA activities. As of September 30, 1987, 35 million acres of this land had been mapped. Approximately 59 million acres of FSA land remain to be mapped by January 1, 1990.

During FY 1987, the greatest workload vas concentrated in the upper Midwest and Northern Plains states. Five states: Illinois, Hlssouri, Minnesota, Montana, and North Dakota accounted for 45 percent of the nations remaining FSA acres to be mapped. During FY 1987, special assistance was provided to the soil survey program in those states for planning and implementing management strategies developed by the 1987 Soil Survey Task Force. Fifty-five soil scientists were detailed into these 5 states during the summer and they alone contributed over 1.4 million acres to this mapping effort.

In 1968, emphasis is being placed on assisting the 25 states with the greatest remaining acreage of FSA priority lands. Additional funds were provided in the 1988 Appropriations Act to increase productivity of soil survey activities and to prioritize mapping of FSA lands. Management initiatives being undertaken to enhance productivity include: authorization of overtime for soil survey project members, temporary reassignment of soil scientists from areas where seasonal climate inhibits mapping activities to areas with less severe weather conditions, hiring additional soil scientists, and contracting out mapping activities where qualified private sector soil scientists are available.

This past winter there vere 49 soil scientists on temporary details in the states of Arizona, California, Florida, Louisiana, North Carolina, Texas, and Virginia. We have needs for 107 soil scientists on details this next summer and 86 the following winter. Sixty-four soil scientlsts have been assigned for this summer. In addition, funds are being provided to states for hiring additional soil scientists in an attempt to offset the continuing loss of soil scientists from SCS.

Each state has recognized this workload as a national priority and has a plan for completing the mapping of this cropland and potential cropland by January 1, 1990, and/or for providing staff to other states needing assistance.

NATIONAL PROGRAM

I. Fifty individual states, each with its own program

It is a challenge to coordinate the efforts to address our National concerns.

II. Current Issues

A. Food Security Act of 1985

B. Water Quality: How do we rate soils for their ability to absorb or allow for leaching of:

1. Pesticides

2. Fertilizers

3. Indigenous salts

4. Herbicides

5. Municipal and industrial waste

C. Complete the Individual States Inventory of Soils

1. Improve efficiency by 20 percent as called for in the productivity improvement study

2. Provide adequate training to soil scientists

D. Provide technical soil services

1. Modernize soil surveys

2. Develop legends on HLRA or physiographic basis and update regions rather than individual soil survey areas, leading to state legends supporting digitized data base

3. Maintain staffing

E. Digitizing of Soil Surveys

1. Incorporate digitizing into the ongoing soil survey processes

2. Digitize existing surveys on a planimetric base

3. Digitize up-to-date soil surveys that are not on planimetric base

III. Attracting Soil Scientists: Continues to be a need for soil scientists and we are having trouble finding them

GEOGRAPHIC INFORMATION SYSTEMS

by

Scott A. Samson
Conservation and Survey Division
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Among the various tools available to the soil survey program, the geographic information system **(GIS)** offers the ability the generate innovative maps **as** products of the survey. Maps can be prepared from tabular data published in the soil survey as well **as** from models integrating soil data with ancillary information, **such as** Digital Elevation Models **(DEM)** or remotely sensed data.

Definition

A geographic information system **(GIS)** is **a** data base system in which most of the data are georeferenced, and upon **which a set** of procedures operates in order to answer queries about spatial relationships in the data base. Key words in this definition which set GIS apart from conventional data base systems **are "georeferenced"** and "spatial **relationships"**. Output from topological analysis is usually represented by **a** map product in **contrast** to tabular reports from conventional data base systems.

Potential Problems with Existing Maps

GIS developed in response to several needs not met through existing map products. For example, appropriate **maps** for **a** particular study area may not exist. Field collection of data for **a** specific site can be used to quickly generate **a** map using **a** computer.

Another problem **with** existing maps is that they are frequently **out** of date, end are costly and time consuming to update. Spatial data which may exhibit dynamic characteristics, such **as water** levels or **populat** ion, represent one point in time. Some spatial phenomena, such as meteorological events, require updates of **maps** in very short time intervals. GIS is designed to maintain and produce up-to-date maps quickly.

Maps are often at the wrong scale or in the wrong format for **a** particular need. There are **many cases** in which two maps are **to** be georeferenced to one another only to find that the maps are at different scales or projections. To have **a** cartographer redrew the maps to **a** common scale and projection would require **a** considerable amount of time and expense. A GIS could greatly reduce the time to **georeference** one map to another as well **as** provide **flexibility** to incorporate additional maps of various scales and projections at later dates.

It is too time consuming and expensive to produce new cartographic products to address the various needs of different users. For example, one project may require hydrologic and geologic data to be included on one map while for the same area, but for a different project , only soil mapping units. Rather than maintain a collection of maps with all possible combinations of features, a GIS can "tailor" each map to specific needs of a user. This process not only saves time in the cartographic preparation of a map but also the need to store a multitude of maps containing various features.

Maps are difficult to compare and analyze in order to discern important spatial relationships. If one wishes to determine the common occurrence of two phenomenon, which are represented by two separate maps, one may overlay one map to the other on a light table to delineate the common spatial occurrence. This becomes difficult as the number of maps and the relationships become more complex. A GIS permits Boolean, arithmetic, and statistical computations of spatial relationships found on maps.

Basic Components of a GIS

A GIS is composed of five components : data encoding end input processing, data management, date retrieval, date manipulation, and data display.

Data Encoding and Input Processing

Spatially oriented data my be entered Into a GIS in two ways :as a cell representing a defined area or as a series of X,Y coordinates defining an area. The former data type is referred to as raster data and the latter as vector. "Rasterizing" a map is as simple as placing a grid over the map to be processed. The feature which dominates the area within a cell is assigned to that cell. In complex environments, such as soil mapping units in dissected regions, detail in the shape of the feature is lost.

Vector data retains the shape of complex map features as they are defined by a series of X,Y coordinates. While this approach retains the shape of the feature encoded better than that of cell gridding, it requires a greeter amount of data storage and processing time by the computer. In many situations, the vector data is converted into grid cells after encoding the map.

After data has been encoded, it may be necessary to review the data files for errors and edit accordingly. Edge matching of adjacent maps is performed to ensure that the vectors or raster cells match on the common edge of two maps. Rectification of the completed map to a specific map projection as well as the registration of one map to another is also performed at this step.

Data Management

This component is an ongoing aspect in a GIS environment. Date management is responsible for the support of the GIS operating environment as well as the users. It is this part of the operation which must ensure efficient data handling, storage, and updating and data integrity and security.

Data Retrieval

Before any analysis of the data **can** be accomplished, it is necessary to extract **both** spatial (graphic or image) and non-spatial (attribute) data from the original date library. Obtaining **a** subset of the data prior to analysis reduces the demand on the computer resources. Data **retrieval** also includes the extraction of features based on defined or undefined relationships **(e.g.,** all soils located in **a** particular county).

Data Manipulation and Analysis

The benefits of **a** GIS **are** realized when the actual analysis takes place. For example, the amount of time to generate maps **depicting** slops and **aspect** from discrete **topographic** date is considerably faster than if **a** cartographer would construct similar maps from conventional manual techniques. Data analysis in GIS also includes **:** topological **analysis;** optimum corridor determination; perimeter, **area,** and volume **measurements; neighborhood** statistics, measurements of distance or direction; and **visibility** mapping.

Along with the generation of various map products, data analysis can also provide tabular reports to summarize spatial phenomena.

Date Display

The products from **GIS** analysis may be graphic, maps, or tabular. These items may be produced on paper products, photographic media, or mylar for dimensional **stability.** The means to generate the products can be through line printers, pen and electrostatic plotters, video display tube **(VDT),** or film recorder. In regards to the **graphic** or map data, the higher quality products usually require the investment of more expensive equipment.

Economics of a GIS

From **a** management standpoint, the cost-benefit of **a** GIS **is** of **an** important concern. One **must** be **aware** of the impact of "technological euphoria" on decision making and attempt to be objective on whether GIS **is** of **economic** soundness in **a particular** application.

The **initial** investment in **a** GIS system should be in the selection of a person **, or** persons, with some GIS background. To purchase the software and hardware for **a** GIS and then hlre **a** staff for the **GIS** is "**putting** the cart before the horse." Having **a** staff who have knowledge of available GIS software and hardware **will** probably save money in the long run. The GIS specialist should be able to assess the needs of the agency **desiring a GIS** and be able to select a system to best complement the goals of the user. It is not always the most expensive **GIS** which will be the best.

The next major investment **in a GIS,** following the purchase of the computer hardware and software, is data input and editing. This step can be long and tedious. **However,** the staff requirements for this task do not require hlghly skilled research or managerial staff. A trained technical support group, with background **similar** to that of

cartographers, will ensure that data is quickly and accurately encoded and edited.
The remaining staff associated with a GIS are the managerial staff and scientists who support and conduct research, respectively, in the the GIS environment.

Choosing a GIS

Some considerations to bear in mind when choosing a GIS are as follows.

Determine the users' requirements. Does the user have specific, defined tasks to address all of the time. some of the time, or is every task different in application.

What is the scope of the application? Are the projects usually short term or long term from point of inception to conclusion? What is the geographic scale of the project? Both questions are related to the ability of the GIS system to quickly generate products. Sometimes this is a compromise with graphic output of somewhat higher cartographic quality. In addition, the size of the project has an impact on the capacity of the storage media (e.g., disk and tape) as well as the speed of the computer. More expensive computers generally have much faster processors than the conventional table top model.

Consideration should be also given to the potential for technological obsolescence of a GIS. While computer systems specifically designed for GIS applications may have features which speed the process of data entry or analysis they may also be difficult to upgrade if technological improvements in hardware or software changes should come about. The more hardware components that "come off the shelf", the greater the chances for peripheral upgrades on the computer as technology changes.

The choice between a raster based or a vector based GIS is dependent upon the users' applications and budget. There are several raster based GIS's on the market and fewer vector and quadtree based systems. In general, the systems that offer the combination of raster and vector data systems will have a tendency to be relatively expensive. The user should determine what type of data system best meets their application. For example, if an application focuses upon the mapping and analysis of utility systems or transportation networks, a vector based GIS would be more appropriate then would a raster based system. However, an application where large amounts of data are to be processed at a regional level 8 caster based GIS would be more appropriate.

If GIS is to be included as a unit within an agency It is necessary that the organizational structure include a GIS component. Using and maintaining a GIS is more than a sideline affair. To properly oversee the input of data as well as the maintenance of data files, a fulltime staff is necessary.

Other considerations for the investment into a GIS include continual maintenance of the hardware and software (approximately 10% of the value of the investment), continual training of the staff using the GIS, and securing a budget for future efficient operation of the GIS as a solid component within the parent agency.

Conclusions

A GIS should not be considered 8 static environment. **Data** is always added ss well as refined in the **CIS** data base. Input from the user community assist the **GIS** data base management and support group to review their services provided to the user. New technology in the computer **area** provides **new** tools for CIS to make the tasks of data entry, **edit, management,** and use easier than before. Efficiency in the operation of **a** GIS results in more investment in the use of the products of the GIS and less in the processing and management of the data.

Soil Digitizing Program of the Iowa Cooperative Soil Survey

T.E. FENTON, Iowa State Univ.

The phases of the Iowa Cooperative Soil Survey Program include mapping, maintenance, and application. Digitizing of the soil survey maps is a major component of the application phase. A Memorandum of Understanding among cooperating agencies (Soil Conservation Service; Iowa Agric. and Home Econ. Exp. Sta.. Coop. Ext. Service, Iowa State Univ.; and Div. of Soil Conservation, Iowa Dep. of Agric. and Land Stewardship) with the contributions of each agency specified was completed in March of 1987.

The basic program (MS DOS) was acquired from the Univ. of Minnesota and subsequently a Memorandum of Understanding regarding use of the software and exchange of computer programs was completed with them. Soil lines, drainageways, and spot symbols are digitized using hardware and software for

Missouri's Experience in "GRASS"

Richard L. Tummons
Assistant State Soil Scientist

There appears to be two main groups within SCS studying the applicability of the present-day Geographic Information software. One group is in Washington, D.C. headed by Gale TeSelle, the other is in Fort Worth, headed by Carter Steers. Each group is looking at different segments of this broad new world of displaying geographic information.

Software being looked at closely within SCS to run the geographic information system includes:

GRASS
MOSS
ARC INFO
Delta

Each software package has pros and cons. Keep in mind that we, as an agency, are in the trial stage of looking 8 t GIS sof tware and that most packages were designed for other applications and not SCS applications. The initial trial stage for GRASS has been completed. It, even with some shortcomings, appears to be the one best suited to our FOCUS equipment.

GRASS stands for -- Geographic Resource Analysis Support System. It has been developed by USA-CERL In Champaign, Illinois, a branch of the Corp of Engineers, U.S. Army.

Many software users consider this "roster" or "grid-cell" package to be the Cadillac for public domain software. The only costs to us would be the tapes for transfer. SCS has contracted for a "roster" to "vector" analysis or perimeter analysis. This program addition is being done by the University of Missouri.

At present, GRASS is being tasted on AT&T 3B2 computers with 72 megabyte hard disks. It is very slow -- 5 to 10 min per query.

The seven SCS test states (MO, NY, VT, OK, WA, CO, and HI) use GRASS to test four procedures that would be useful to SCS personnel:

A. Proximity Analysis:
   1. Studying the relation of feedlots to location of streams to determine possible pollution locations.
   2. Location of streams to hydric soils to assist in studying runoff.

B. Soil Conservation flaps: The ability for the Soil Conservationist to prepare soil maps, ownership maps, and land capability maps.

C. FSA Analysis: Preparing highly erodible soil maps, potentially highly erodible, and nonhighly erodible maps.

D. Soil Interpretative Haps: These are the commonly used map6 that soil scientists associate with, that is, depth to water table, prime farmland, or septic tank filter fields.

CERL plans to release version 3.0 of GRASS in July. They will then work with SCS on a series of enhancement6 desired by SCS. By October, the 3.0 version with the SCS enhancement will be available and released to SCS for use.

GRASS is best suited to use with digitized soil data from a planimetrically accurate map or orthophoto source. If these sources are not available, data sources will need to be converted and digitized inhouse or by contract.

Initial start up costs will vary depending on equipment available. A 3B2 will work, but a 6386 with 135 megabyte6 of memory is recommended. A digitizing tablet with accuracy for soil digitizing (Altek or Calcomp tablet (36x48), $3500-6500) is recommended. A Tektronic 4696 Ink Jet Printer is also recommended.

The startup costs will run from a low of $18,000 to $30,000 depending on needs and equipment available.

Before personnel are assigned to work on GRASS, they need to attend SCS training in Unix and GIS concepts. These classes are being given by SCS or through outside sources. They also need to attend a GRASS-user's training course. These three courses should be completed and the equipment available so the individual can return to the field location and work with the sof tware. It is recommended that 3 to 4 weeks will be needed to get an individual familiar with the GRASS sof tware and digitizing tools.

The Stare Conservationists will be updated in September and provided with the test results. If there are questions, Bruce Thompson will be happy to discuss them with you or you can contact Dick Liston at the CGIS in Washington, D.C.

Soils Research in the Nebraska Sandhills

Gary W. Hergert presented before the North Central Soil Survey Conference June 1988

The Nebraska Sandhills is a unique environment for studying soils and crop production. The area has been predominantly rangeland with interspersed wet meadow areas and has supported a large cattle industry. During the 1970's extensive areas of the sandhills were developed for center pivot irrigation. These coarse textured soils presented many management problems that needed to be addressed to assure profitable production and efficient utilization of agronomic resources. Today I would like to discuss three different research projects that I have worked on in the sandhills.

Zinc Deficiency in Corn

Many of the sandy soils in the north central region of the sandhills are neutral in pH, low in phosphorus, and low in extractable zinc. A study was initiated in 1975 to determine the effectiveness of different zinc fertilizer materials which could be mixed with 10-34-o fertilizer and row applied for corn. This was an important question at the time because different Zn fertilizer materials ranged from as low as $0.50/lb to as much as $10.00/lb depending upon the zinc source used. The objective of the study was to evaluate the effective of five zinc sources including zinc EDTA, zinc ammonia complex, zinc oxide, zinc sulfate , and zinc nitrate applied at five rates - 0, 0.1, 0.3, 1.0 and 3.0 lbs actual zinc per acre. The experiment was conducted at four locations during a 2 year period of time. All zinc sources were suspended in ammonium polyphosphate and applied to the side of the row and below the seed. Significant differences among zinc sources for zinc uptake were shown. Zinc EDTA performed poorly at two sites due to early season leaching, however, it was the superior source on a calcareous soil. Grain yields were increased by zinc fertilization only at two locations and there were no differences among the zinc sources or significant zinc source by rate interactions. The research work showed that between 1 and 2 pounds of zinc/acre was required to obtain maximum yield when zinc was row applied.

REFERENCE

Hergert, G.W., G.W. Rehm and R.A. Wiese. 1984. Field evaluations of zinc sources band applied and ammonium polyphosphate suspension. SSSA J. 48:1190-1193.

Nitrate Leaching in Sandy Soils

Currently, there is a lot of public concern about the quality of drinking water. National attention has been focused on this issue through the US Congress. In Nebraska most of the attention has centered on nitrate-nitrogen because it has an identifiable source in fertilizer N inputs. Nitrogen management on sandy soils is difficult due to the high potential to leach nitrogen. However, adequate nitrogen must be applied for growing corn on sandy soils to maintain profitable yields. The concern in the Nebraska sandhills is that nitrate leaching will enrich the groundwater in nitrate. Currently the water quality in the

An experiment was conducted at the University of Nebraska Sandhills Agricultural Laboratory located 50 miles north of North Platte to quantify nitrate leaching under irrigated corn. The soil at the site was a Valentine fine sand. Ceramic candle moisture extractors were buried at a 6 foot depth to sample soil water that percolated below the crop root zone. This solution then was measured for nitrate nitrogen to determine nitrate loss. The nitrogen rate used on the plots was 180 lbs N/A which was very typical of farmer practice during that time.

Irrigation rates were 85 and 130% of evapotranspiration (ET). Total dry matter, grain yield and crop nitrogen uptake were not significantly affected by irrigation level. During the two year study and average annual flow weighted nitrate concentration in extracted soil water ranged from 28 to 75 milligrams of nitrate-N per liter for the 0.85 and 1.30 ET irrigation treatments. In 1976 the low water treatments lost 10 pounds of nitrogen/acre whereas the higher irrigation treatment lost 70 pounds nitrogen/acre. In 1977 100 pounds of nitrogen/acre was lost for the low irrigation level and 120 for the higher irrigation level. The higher soil water and nitrate losses in the second year resulted from over winter precipitation and early spring leaching of the previous year's residual nitrate. in-season nitrate leaching was generally reduced by matching irrigation requirement to evapotranspiration. To effectively reduce nitrate leaching nitrogen fertilizer rates must match crop yield requirements to reduce soil nitrate carryover and irrigation scheduling must be used on these sandy soils.

REFERENCE

Hergert, Gary W. 1986. Nitrate leaching thorough sandy soil as affected by sprinkler irrigation management. Journal of Environmental Quality 15:272-278

Downward Movement of Nitrate to the Water Table

Another question related to nitrogen leaching on the sandy soils is not only the quantities that are leaching below the root zone but the transit time for the nitrate to travel through the unsaturated soil from the bottom of the root zone to the water table. At the sandhills location where the previous research was done the water table is about 100 feet below the soil surface. After quantifying the nitrate leaching losses through the extractors the question was how long would it take this nitrogen to reach the groundwater. An experiment wss designed to determine the distribution of nitrate nitrogen in the unsaturated zone under corn and adjacent native range and to estimate the yearly rate of downward nitrate movement. Deep soil sampling began at a number of locations at the Sandhills Ag Lab in the fall of 1979. The sampling was completed in the spring of 1984. Over this time 12 different sites were sampled to the water table for soil moisture, nitrate, and ammonium content. Three holes per site were taken for averaging of measured parameters over holes by depth. Initially a 3 inch Giddings soil tube was modified to fit a standard Shelby Tube Head. The tube was pushed into the soil or pounded in with a 150 lb drop hammer. The soil sampling was taken from undisturbed cores in one foot increments. Later the sampling procedure was changed due to an equipment change and an auger rig was used. This machine was fitted with a 3 inch screw auger in flights of 5 feet. The auguring method provided a fairly good undisturbed sample. The sample increment was changed to 2 1/2 feet because of some mixing over smaller increments. Soil samples from a given depth were extracted, mixed thoroughly from a depth increment and sub-sampled. The sub-sample of about 2 pounds was placed immediately in sealed plastic bag and stored in a cooler to maintain moisture and temperature. All samples were returned to the lab each night, sub-sampled for gravimetric moisture content, then air dried for later analysis of pH, nitrate, ammonium, and in some instances chloride.

Hole to hole variability at a given depth was not to large in most instances. Variation was greatest in the upper 30 feet due to soil textural differences caused by shifting of sands in the recent geologic past. Only slight differences between nitrate-N under alfalfa and its adjacent native range were evident. A substantial difference nitrate-N distributions under irrigated cool season grass and its adjacent native range were found. The soil under the irrigated grass was enriched with nitrate-N compared to native range to a depth of 21 feet. The irrigated grass was produced only from 1975 to 1977 and the work showed that the bulk of the nitrate movement probably occurred in 3 years at an average rate of about 7 feet/year. Definite nitrate enrichment under irrigated corn compared to native range was shown to about a 50 foot depth. Average movement of a nitrate bulge under the corn between the spring of 1980 and 1981 was about 7 feet. For the total of the seven cropping years under corn nitrate movement showed an average of about 7 feet downward movement per year. A simplistic vadose zone nitrogen budget indicated that some nitrogen loss may have been occurring as the nitrate bulge moved deeper. The overall fact is that once nitrate does get below the root zone it does continue to move downward toward the water table. In many areas nitrate problems may not be experienced for a number of years because in this instance a period of 13 to 15 years would be required for the first nitrogen that was applied in the mid-70's to reach the groundwater.

REFERENCE

Hergert, C.W. 1982. Distribution of mineral nitrogen under native range and cultivated fields in the Nebraska Sandhills. Project Completion Report to the US Dept. of Interior. Nebraska Water Resources Center, Univ. of Nebr., Lincoln, NE.

Our experience in the sandhills has shown us the same thing that the "Kincaiders" learned almost 80 years ago. The sandhills environment is a fragile eco-system that requires careful management. There are areas in the sandhills that are suitable for irrigation development. Many of the areas that have been developed luckily have gone back to grassland under the Conservation Reserve Program and that's probably where they should stay. Those areas that are developed for irrigation will require careful management. Research provided by the University of Nebraska is helping farmers to manage nutrients and water on the sandy soils to supplement profitability in normal sandhills ranching operations

NATIONAL SOIL SURVEY CENTER STATUS REPORT

C. Steven Holzhey, Ast. Dir., Soil Sur. Div., SCS

The National Soil Survey Center (NSSC) was established May 8, 1988, with a mandate to become an international center of excellence in soil science. The NSSC is a dream that was skillfully made into reality by a small group of people in SCS. The architects and promulgators of the dream deserve strong congratulations for avoiding the many pitfalls that have tripped so many good ideas.

Let's look at the makeup of the NSSC today. The handout (next page), shows the overall organization and the relation to the Midwest National Technical Center.

The NSSC is to have 5 staffs. The National Soil Survey Laboratory (NSSL) was already in place. It will be augmented by the geomorphology positions and a few others that were elsewhere. Ellis Knox will continue as National Leader for Soil Survey Investigations, and will head the augmented staff.

The National Soil Survey Quality Assurance Staff (NSSQA), was formed over the past several months by combining correlation, manuscript and editorial staffs from the 4 National Technical Centers. The function was changed somewhat in line with current SCS policies. Quality control is now essentially done within each state, with a quality assurance oversight role from the NSSQA. Rod Harner will continue as National Leader.

Three other staffs are being formed: each with 5 to 8 soil scientists. They are National Soil Classification (NSC), John Witty, National Leader: National Soil Survey Interpretations (NSSI), Maurie Mausbach, National Leader: and National Soil Survey Data Bases (NSSDB), National Leader still to be chosen. The classification staff will continue with improvements in Soil Taxonomy, the Soil Survey Manual and related tasks. The interpretations staff wil have functions similar to the previously existing staff in Washington, except for data bases. The data base staff will lead in the systems analyses, designs and implementation of soils data bases. The new staffs and the old are large enough to make a difference in the NCSS, but not large enough to do all the things we in this room could think of them to do. As our roles evolve toward the future, we should remember that our functions are best served by a truly cooperative NCSS.

A number of issues and developments are changing the demands for soil survey information. Offices are bristling with new electronic gadgetry that holds great potential for information delivery and use. Whole new scientific communities are forming to meet burgeoning demands for answers to new questions. There is also growing competition for funds. We hope the NSSC can help to catalyze the separate efforts, ideas and knowledge that are represented by members of this conference to strengthen our own competitive status, and to provide the information needed to match the potentials of new technologies. The NSSC will be conducting a multiphase brainstorming, planning and design effort which we hope will be part of a truly cooperative evolution in NCSS. We are and will be oriented toward service. We want to help maintain one soil survey for the United States that will serve not only local needs, but can also be generalized regionally and nationally for a variety of purposes. At the same time we want to help keep a flexibility that allows for local needs.

To promote evolution of our products, maintain one national soil survey while keeping flexibility, to provide needed services, and to keep the NCSS indispensable is no easy task. It will take all of us working together: possibly better than ever in the modern history of the NCSS.

MIDWEST NATIONAL TECHNICAL CENTER
Dornbusch, Director

- NATIONAL **SOIL SURVEY CENTER**
  Holzhey, Am. Dir., **Soil Sur. Div.**
  - SOIL SUR **QUALITY ASSUR.** **(NSSQA)** — **Harner, Nat'l Leader**
    - **WEST**
    - **CENTRAL**
    - **EAST**
    - **EDITORIAL**
  - SOIL SUR. **INVESTIGATIONS** **(NAT'L** SOIL SUR **LAB.)** — Knox. **Nat'l Leader**
    - CHAR DATA
    - **LAB.** API'.
    - **LANDSCAPE STUDIES**
  - SOIL **CLASSIFICATION** — **Witty, Nat'l Leader**
    - SOILTAXONOMY
  - SOIL **INTERPRETATIONS** — **Mausbach, Nat'l** Leader
    - EROSION
    - **SALINITY**
    - **ENGR. &** URBAN
    - CROP
    - **RANGE**
    - WOODLAND
  - SOIL SUR DATA **BASES** — **Vacancy Announced**
    - NSSC **SPT**
    - **STATE SPT**
    - **SYSTEMS ANAL & MAINT.**
- ECOL **SCI.** & PLANNING (ESP)
  - SOIL INTERP. **Culver** Soil Sci.

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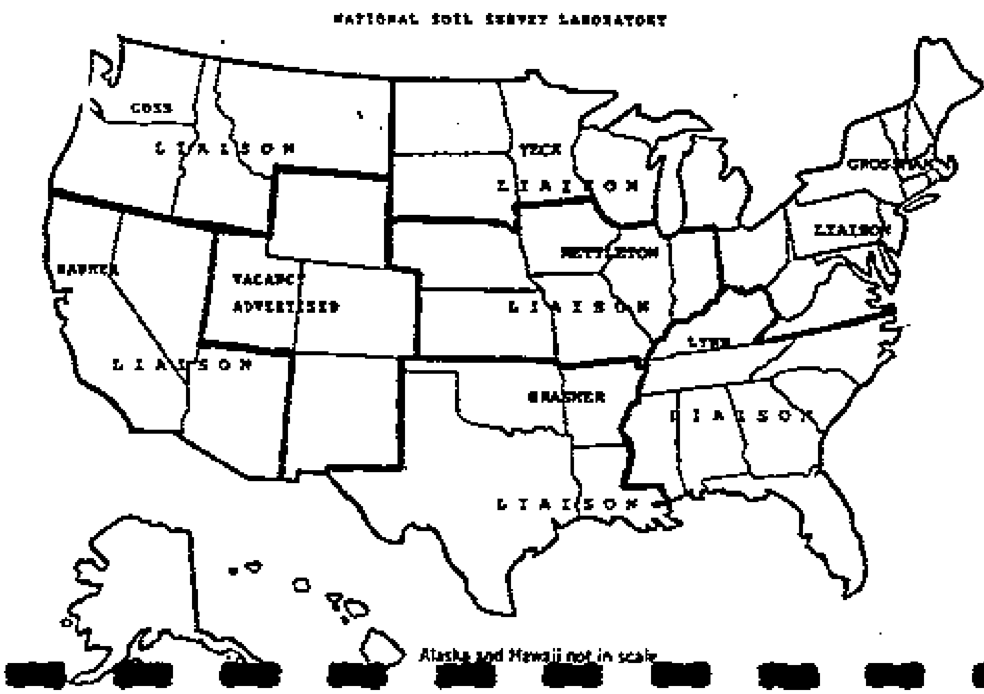

National Soil Survey Laboratory
Ronald D. Yeck

Currently, at the National Soil Survey Laboratory, we are anticipating significant organizational changes, and, yet, a number of functions and services will remain unchanged. I will begin by discussing the functions that we anticipate to continue without major changes, then note some priority issues to which NSSL is responding, and finally, talk about some new opportunities that become options because of the planned organizational changes.

The service functions of NSSL will continue essentially without change. We will continue to receive characterization, reference, and special samples, analyze them, and provide results to the field.

In 3997, the NSSL received approximately 7000 samples for analysis. Characterization and reference samples, on which major analyses were performed, constituted about 5000 samples. The remaining 2000 were miscellaneous samples for special or minimal analysis. Of the characterization and reference projects, just over one-third were from the North Central states. Fewer samples were received last year than in previous years, probably because of other pressures such as the Farm Security Act. On the other hand, more analyses were requested on the samples that were received, so the total amount of analytical work was as much or perhaps more than in the past. There was an average of more than 20 analyzes per sample last year.

A number of universities in the Midwest also provide laboratory services to the National Cooperative Soil Survey. That remains an important and necessary partnership for providing laboratory data within the NCSS. NSSL could not handle all of the laboratory data needs so it is important that a number of NCSS cooperators make their contribution, in part, by providing laboratory services in their states.

Data sent to the field from the NSSL may take a number of forms. Depending on the project objectives, as outlined in project work plans, data may be accompanied by a comprehensive discussion of the data by the NSSL project coordinator, or the data may come with no more than a letter of transmittal if little interpretation is needed. Data are also available to cooperators electronically through a program called INTERACT whereby data that reside in the mainframe computer in Lincoln may be accessed remotely. During the past year, states that wanted data that pertained to them have also been provided tapes. On a table in the back of the room there are copies of a listing of pedons on which data are available for states in the North Central Region. We would like for each SCS state office and the NCSS cooperator in each state to have a copy of that listing. During the week of July 25, a NCSS committee will meet in Lincoln to consider contents of a proposed National Soil Characterization Data Base. you are now recieving questionnaires regarding the content of that data base. I will take the completed questionnaires back with me, or you may mail them directly to Benny Brasher at the NSSL.

NSSL staff members continue to conduct research projects that include laboratory methods and methodology as well as studies that address soil-landscape or soil-water relationships and others that are designed to refine criteria in Soil Taxonomy.

We are also involved in current issues such as erosion and water quality concerns. Many of you have been involved with the Water Erosion Prediction Project (WEPP) that is designed to develop new generation water erosion prediction technology. SCS soil scientists helped select WEPP sites and assisted sampling pedons for the sites that were to be analyzed at the NSSL. The ARS is making erosion measunnents using rainulators on the selected sites. Among the North Central States, pedons were sampled last fall in Minnesota, North Dakota, Nebraska, Iowa, and South Dakota and this spring in Missouri and Ohio.

NSSL scientists are also involved in water quality issues. They worked with ARS and state SCS scientists in Nebraska to develop a pesticide use guide for Nebraska soils. Also one NSSL staff member is assigned to the Water Quality Assessment Project (WQAP) and is working full time on that for the remainder of FY '88.

We continue to work on projects jointly with many of you at the experiment stations. We expect this to continue and hopefully increase as we join resources for projects that may be more completely developed by our joint efforts.

Now let me address some of the changes that we anticipate as some organizational readjustments are made as the NSSL becomes part of the National Soil Survey Center.

Steve Holzhey discussed the organization of the NSSC earlier and mentioned that a Landscape Unit will become part of the NSSL. The reemphasis of geomorphology and field research is exciting. Many of us feel that this brings back a research dimension to pedology at the national level that will allow to us to more completely address not only soil-landscape relationships but also current issues such as water quality.

We are rethinking the manner in which NSSL Liaisons will function within the new organization. Their geographic assignments now correspond neither with NTC nor Quality assurance staff boundaries. We may want to change the geograpic structure and even change the function to NSSL Liaisons somewhat. If any of you have some thoughts about those functions, we would welcome your comments.

With other NSSC units located in Lincoln, interaction will be easier. With that, we see NSSL providing more balanced support for all functions of the NCSS. For instance, we see the opportunity to more fully assist in the soil interpretations program than in the past. We also expect that there will be more of a chance to see where research needs exist and to jointly initiate some projects among units of the NSSC and with you in the states.

As we have discussed during this conference, computer models are with us and we will be called upon to provide data in support of those models. We also have responsibility to use our data and our experience to evaluate those models for use in our science.

We have discussed some functions of the NSSL that will continue without very much change, some changes that we see on the horizon, and how those changes may affect how we do our jobs in the future. Gail Sheehy wrote a book in which she described the transition times in our lives as "passages." With the changes that we will be making both in the National Soil Survey Laboratory and as part of the National Soil Survey Center, we are now, and for the next few years will be, participating in a "passage." With this "passage" comes some uncertainty but also tremendous opportunity as we continue to serve the NCSS in traditional ways and look for new opportunities to provide assistance and service.

A BRIEF GEOLOGIC ACCOUNT OF THE NEBRASKA SAND HILLS

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University of Nebraska
Lincoln, Nebraska 68588-0517

INTRODUCTION

The Sand Hills of central Nebraska, covering over 50,000 sq km (19,300 sq miles) constitute a unique physiographic, geologic and hydrologic province in the United States. New data on the morphology, sand transport directions, sedimentary structures and chronology of the eolian deposits of this stabilized sand sea have been gathered in recent years that provide new insight into the origin of the Sand Bills. Recent test drilling projects have also provided a better framework for understanding the enormous groundwater reservoir that underlies the dunes.

DUNE MORPHOLOGY AND DISTRIBUTION

H.T.U. Smith (1965) published the first systematic study of Sand Hills dune morphology. He recognized three different types: 1) large-scale transverse dunes (Series I); 2) narrow longitudinal dunes (Series II); and 3) areas of undifferentiated dune topography including parabolic and blowout dunes (Series III). The transverse dunes were further subdivided into those modified by superimposed longitudinal dunes and by blowouts.

Ahlbrandt and Pryberger (1980), in a study emphasizing primary sedimentary structures, divided the Series I dunes of Smith (1965) into barchan, barchanoid-ridge and transverse-ridge dunes and argued that the Series II dunes were probably smaller scale transverse-ridge dunes. They were using the descriptive classification developed by McKee (1979). This gross morphologic classification is based on two main descriptive features--the overall shape of the individual sand body and the number and position of slip faces. Information obtained from studies of internal dune structure and world-wide satellite imagery of sand seas contributed to the classification. Swinehart (1986) modified McKee's (1979) classification for the Nebraska Sand Hills and using Landsat images, topographic maps and selected aerial photographs mapped the dune types.

Although the number of basic or simple dune types is fairly small, when they occur in combinations a large number of varieties are created. Barchan and barchanoid ridge dunes, which may occur in a gradational sequence, are collectively referred to as "crescentic" dunes. McKee (1979) used the term compound dune to describe a dune made up of two OK more dunes of the same type (eg. small barchans superimposed on other barchans) and used the term-complex dune-for one made up of two different basic types (eg. linear dunes superimposed or barchanoid ridge dunes). Most all large dunes in the Sand Hills have blowouts superimposed on them giving a dimpled texture to the dunes. The area of parabolic dunes in the southwestern Sand Hills is an anomalous feature of the Sand Hills proper. They represent an extension of the parabolic dune fields of northeast Colorado and southwest Nebraska (Muhs, 1985).

SUMMARY OF SANE HILLS GEOLOGIC HISTORY

This inland sand sea, the largest in the Western Hemisphere is presently stabilized by grassland vegetation; areas of blowing sand are small and scattered. However, as recently as 3500 to 1500 years ago, formation and migration of sand dunes took place over a significant portion of the Sand Hills (Ahlbrant and others, 1983). These authors described five localities from the south central Sand Hills where radiocarbon dated sequences limit eolian activity to the last 7000 years.' They concluded that the Holocene (10,000 years ago to the present) has been a very dynamic time, during which several episodes of widespread eolian sedimentation activity occurred, possibly as a result of abrupt environmental changes throughout the Great Plains and Rocky Mountain Basins. While sand dunes may have formed at several intervals during the late Pleistocene as proposed by Lugn (1935), Smith (1965), and Wright and others (1985), there is currently no eolian sediment known in the Sand Hills with a documented minimum age older than 10,000 yr. B.P.

There is still much to be learned about the climatic and environmental conditions necessary to form the various dune types making up the Sand Hills. From studies of modern inland sand seas (eg. McKee, 1979) it appears that wind regime, precipitation (especially as it effects plant cover) and availability of sand are the primary factors influencing dune development. Ahlbrandt and Fryberger (1980) analyzed present-day winds in the Sand Hills and concluded that "were it not for the rainfall of the region, which supports a stabilizing vegetation, the sand sea would be very active...." To what extent precipitation would have to decline to reduce the present plant cover to a level where the dunes would be free to migrate is unknown. Modern active sand seas such as the Rub'al

Khali of Saudi Arabia and the Takla Makan of the People's Republic of China, both of which contain areas of dunes similar to the large crescentic and dome-like dunes in the Sand Hills generally have less than 4 inches of precipitation a year. Large dunes such as these form only under low vegetative cover (perhaps less than 20 percent). Goudie (1983, p. 154) concluded that such dunes "...occur only where annual rainfall- is less than about 250 mm (9.9 in.)...." Given certain combinations of rainfall distribution, wind and temperature regime and vegetation type, large continental dunes might be able to develop with precipitation amounts of up to 250 mm (9.9 inches) per year.

Ahlbrandt and Pryberger (1980) made approximately 1000 strike and dip measurements of eolian cross-bedding from exposures scattered throughout most of the Sand Hills dunes. They concluded that there was a general northwest-to-southeast movement of sand except for a southerly component of transport in the McPherson and Lincoln county areas.

The Sand Hills also contains dune types that apparently are controlled by partial stabilization from vegetation and/or moisture (McKee, 1979). These include parabolic dunes, blowout dunes (not visible on Landsat images) and possibly some types of linear dunes. Such dunes usually require a minimum of 20 to 50 percent vegetative cover to form.

There has been considerable debate'over whether the Sand Hills formed in a hot or cold climate. Active eolian sand dune fields are found in cold climates today (eg. Alaska and Iceland) but build at a much slower rate than in equivalent wind regimes in warm climates. Ahlbrandt and others, (1983) concluded that if large-scale dunes had formed during Late Pleistocene cold climates in the Sand Hills area, they would probably be'highly modified and have some record of the coexisting cold-climate (boreal) fauna and flora. Neither of these features have been documented in the Sand Rills. If such older dunes existed, they should have a better developed soil profile than dunes known to postdate the last glacial stage. Muhs (1985) studied soil development on Nebraska Sand Hills dunes overlying radiocarbon dates of about 10,000 to 3100 years B.P. He found no soils with pedogenic development beyond immature A/AC/C profiles and noted that none are described in the modern soil surveys of the Sand Bills. Muhs concluded that although older dunes may have once existed in the Sand Hills, the soils evidence indicates they have only been stable since the late Holocene.

The Sand Hills dune sand is predominantly a fine sand composed of approximately 70 percent quartz, 20 percent feldspar and 10 percent chert and rock fragments (Ahlbrandt and Fryberger, 1980). The major source for this sand was probably the extensive sheets of unconsolidated Pliocene and Quaternary fluvial sands that underlie a significant portion of the Sand Hills (Ahlbrandt and others, 1983 and Swinehart and others, 19851. The Miocene age Ogallala Group sands and sandstone may have also been a source, especially in the northwestern portion of the sand sea.

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1988 SOUTHERN REGIONAL WORK PLANNING CONFERENCE
June 13-17, 1988
Knoxville, Tennessee

committees

I. Soils Laboratory Data Bases

Chairman: carter steers

Charges: 1. Develop a plan for reforming and combining the State Soil Survey Laboratory data files and the National Soil Survey Laboratory data files for a central user access system.

2. Make recommendations for a schedule of cooperative listing and evaluation of an automated laboratory data base system.

II. Soil Interpretations

Chairman: DeWayne Williams

Charge: 1. Identify and characterize soil characteristics that affect soil interpretations.

III. Laboratory Methods and Analysis

Chairman: B. R. Smith

Charge: 1. The exchange of selected soil samples among laboratories in the South Region and the National Soil Survey Laboratory with the objective of determining varability within and between the participating laboratories for common characterization analysis and procedures.

A summary of the Southern Conference Committees presented to North Central Work Planning Conference by Darwin L. Newton, State Soil Scientist, Tennessee.

IV. Soil Water

Chairman: E. Moye Rutledge

Charges: 1. Keep the Southern Regional Soil Survey Work Group informed on proposals of the International Committee (ICOMAQ) and any related activities within our region.

2. Develop guides for collecting a soil water data base.

V. Soil Survey and Management of Forest Lands

Chairman: Jim Keys

Charge: 1. To address the development of specific interpretations needed for soil surveys where the major land use is forestry.

2. To determine suitable ways to present forestry interpretations in soil survey reports.

VI. Mine spoil - Classification and Interpretation

Chairman: John T. Ammons

Charge: 1. Establish criteria to inventory mine lands.

North Central Soil Survey Conference
North Platte, Nebraska
June 21-24. 1988

FIELD ACTIVITIES

A field trip to the Sand Hills of Nebraska was one of the highlights of this Conference. An excellent Field Guide was prepared by Larry Ragon and Mark Kuzila. Soil scientists who helped with the trip were:

Carol Bartles
Glenn Borchers
Roger Hammer
David Hoover
Charles Mahnke
Steve Scheinost
Wayne Vanek
Jay Wilson

and District Conservationists Barbara Bush and Russ Leidings.

The first stop was at the Rogers Ranch. Ken and Anna Rogers explained the operation of their ranch. At the Rogers Ranch, the group was subdivided into five subgroups, and each subgroup viewed five sites. These sites were:

1. Tryon soil pit. The Tryon series is a member of the Mixed, mesic Typic Psammaquents.
2. Ipage soil pit. The Ipage series is a member of the Mixed, mesic Aquic Ustipsamments.
3. Valentine soil pit. The Valentine series is a member of the Mixed, mesic Typic Ustipsamments.
4. A geological site at which Jim Swinehart discussed dune formation.
5. "Big Hill" site was a high elevation that overlooked the ranch.

The second stop of the trip was the Collier Ranch where a stratigraphic section of the Sand Hills was viewed and explained by Jim Swinehart. Some of the group enjoyed a dip in the Dismal River on a very warm (hot) June afternoon.

The third stop was at Devils Den Canyon where the geology and geomorphology of the ares was viewed and discussed.

We arrived at the motel at the scheduled time and everyone expressed their appreciation to the Nebraska group for an excellent and informative trip.

Report for Committee 1 - Development and Coordination of

Soil Survey Data Bases - William Frederick, Vice-Chairman

Charge 1 - Whet kinds of soil survey data bases will we need for mapping unit interpretations to support the long-range soil survey program beyond 1990? Consider the vast amount of soil fertility data and engineering test data available in state and private laboratories. Should some of this data be part of the soil survey date base?

Responses from the committee indicated that the State Soil Survey Data Base

Charge 3 - Identify ways that encourage or enhance the exchange of data information among National Cooperative Soil Survey (NCSS) cooperators.

The committee felt that one of the best ways to encourage or enhance information or data exchange was through the development of a common data dictionary containing codes and their definitions for data used in the data base. The data dictionary which is already part of the 3SD could be used as a good starting point. Other items could be added by each state contributing to the data dictionary. A data dictionary would allow all potential users of the data base to know what it contains.

Other items mentioned as ways to encourage information exchange, which are already being implemented by some states, are: the establishment of committees which query soil survey cooperators as to what data is available, what format it is in and who is the contact person for the data; joint projects which may help to pool information; and memos of understanding. There was a feeling on the part of many committee members that it would be desirable if there was some mode of communication between states in the region or on the national level as to what data are available in each state and who was responsible for collecting it. One suggestion offered during the workshop was to utilize the "Soil Survey Horizons" publication as a method to circulate this information. Of all the charges issued, the committee felt that this was probably the most important one since communication between NCSS cooperators is essential for any information exchange.

Charge 4 - Identify the academic needs in computer science and related changes at the undergraduate and graduate level for students who wish to pursue a career as a professional soil scientist in our modern day technology. Goal is to provide guidance for curriculum and counseling of students.

There was much discussion during the committee meeting on this charge. The committee felt that a basic knowledge of computers is good but more technical courses are probably more helpful than multiple computer science courses. It was also pointed out that because of the fast change in technology, much computer and software knowledge learned in college may no longer be applicable when students enter the job. In addition to overall knowledge of software programs such as spreadsheet, MS-DOS and word processing; the construction of job computer language, a core of basic computer science classes, training in logical thinking stressed in math courses and problem solving are also essential. The committee felt that on-the-job training is just as important as pre-job schooling and should be scheduled and coordinated with each employee as the job requires.

Remarks and Recommendations:

The committee members felt that there is a need for continuing of this committee and that it should be used as a forum to exchange information on how other states deal with in-state data base management problems. It was suggested that 3SD managers from each of the twelve states be a part of the committee in addition to any other peoplr who may be interested. Reports from individual states would be encouraged.

The committee felt that future needs of data exchange and availability might be further enhanced if a data dictionary (as was discussed in Charge 3) was put together. It would be desirable if this was done on a regional level, but should also be explored on a national level.

The possibility of some written survey or inventory from each state as to what other data sets (lab and other data) are available was discussed but no concensus was reached on this point. Using an existing publication such as "Soil Survey Horizons" was suggested.

Responses To Committee Charges

Charge 1

What kinds of soil survey data bases will we need for mapping unit interpretation to support the long-range soil survey program beyond 1990? Consider the vast amount of soil fertility data and engineering test data available in state and private laboratories. Should some of this data be part of the soil survey data base?

Response 1

The data bases should have the basic physical and chemical data for the mapping unit and the physical and chemical pedon data from university and government agency laboratories. Fertility data, crop yield data, range production data, and woodland production data, to name a few, will certainly also be important.

The most important item necessary to make this data base explosion happen and make these data bases compatible with each other is a common data dictionary. We have approved glossary of terms lists that are published and periodically updated through various professional organizations. The soil data dictionary could be handled in the same way and we should promote this concept.

Response 2

There is a need for additional data base development to meet future needs in the soil survey program. However, because of equipment and personnel limitations, we are not yet making full use of what is currently available. We, in the Soil Conservation Service (SCS), envision the State Soil Survey Data base (SSSD or 3SD) to be the core that all other relevant data sets are linked to. Applications such as Universal Soil Loss Equation (USLE), geographical information systems (GIS), and others would access data from all of the linked data sets through the Map Unit Interpretation Record (MUIR). When additional attributes from the SSSD core are not needed, direct access to the other data sets should be available.

Many data sets are common to all states and many are state or region specific. It is going to have to be the responsibility of the SSSD manager in each state to work with the appropriate persons to make sure that the necessary links are established for state specific data sets. For example, if the Department of Transportation (DOT) is interested in linking to SSSD, the soil mechanics data must be structured into a data set and formatted to be compatible with the existing data base management system and must be linked to the MUIR in SSSD.

Several problems currently exist. The first is how to make the system readily accessible to users outside of the SCS state office. The current systems cannot support additional users during normal working hours without further degradation. Another problem is how to link all of the external data sets together for easy access and data manipulation. Data sets are currently stored at several locations throughout the country. Current state office equipment could not easily handle the storage or processing if all of the data for the state is downloaded. A third problem is how to efficiently process large amounts of data needed for complex query and modeling applications.

There are several data sets that are needed to support the long-range soil survey program beyond 1990. A couple of these, soil fertility data and engineering test data, have already been mentioned for consideration in charge 1. There is a growing need for site specific data for use in GIS. For example, the Kansas Department of Transportation (KDOT) is interested in linking their test data to SSSD for use in planning and design. They have begun restructuring their data base, reformatting the data, and providing the map unit id link to SSSD. Tillage ratings or groups are already used in some states and are being considered by others. These and other interpretive data could be readily added to the central core. Provisions are already in place for adding such attribute5 to the state component table.

Response 3

Soil survey data bases should be available for all the “normal” laboratory analyses and the investigations related to a particular series. This include5 crop yield evaluations, soil fertility or test values, engineering data including conductivity data, atterburg limits, etc. Where feasible, other state and private laboratories should be consulted.

Response 4

The Food Security Act and the potential impact of a Water Quality Act have greatly increased the demand for soil information. The present soil data base will need to be expanded to include information not presently available and still maintain a quality product. Some possible steps to obtain this are:

1. Make all laboratory data from National Soil Survey Laboratory, State Highway Department, and College or University laboratories available to the state who has control of the soil series. The data could be provided to others a5 needed with the use of a JCL.

2. Develop a new soil interpretive record (SIR) to serve a5 a computer input form. It should be expanded to include all soils data needed for planning and research. These expanded SIR's should reflect specific sets of data for a given geographic or geologic area.

3. Fertility data that help5 update productivity indexes and yields should be in the data base. All fertility samples submitted by producer5 for testing should show the map unit name and slope. This could be used to refine fertility recommendations, and perhaps in time a correlation could develop between series and fertility tests.

   A system should be developed for incorporating engineering test results into the data base. We probably have close to 1,000 pedons in North Dakota with engineering test data that should be accessible by all users,

   We need data to aid in estimating pesticide movement and groundwater pollution.

Response 5

I believe the fertility data and engineering test data should be accessible by the soil survey data base. Interpretive ratings need to be updated as more data is collected.

Response 6

Evolving soil interpretive needs necessitate that soil survey data bases include all available soil chemical, physical, engineering, and fertility laboratory data. This data needs to be in a format that is easily accessible and readily available to all users and would provide the data base from which interpretative data bases could be constructed. Interpretive data bases developed from a master soil characteristic data base would provide more soil interpretive consistency across regions and would aid the refinement of current soil interpretive criteria. In addition, the quality and reliability of soil interpretations would be enhanced when all of the data from across a region for a specific soil was available for interpretive analysis. We currently have ready access to NSSL soil data that our state has generated but we do not have ready access to the soil data when one of our correlated series are sampled by another state. The soil characteristic data base should be constructed so that the data could be downloaded by series. Another consideration could possibly be a soil characteristic data base that would consist of statistically consolidated soil series laboratory data which would also be downloaded by series.

Response 7

I feel that soil fertility data and engineering test data other than what is already part of the soil survey data base should be kept as a separate, although relation data base. The adding of all of this data to the soil survey data base would only add to the confusion of what is 'official' soil survey information versus other public information. Keeping a relational tie of a separate data base for the soil fertility and engineering data bases would still allow an information exchange for those who needed that information. These types of relation data bases will probably become more in demand as our computerization of agriculture continues.

Response 8

I feel that specialized data bases other than what is already part of the soil survey data base should be kept as relational, although separate data bases. Adding more data to the soil survey data base could lead to confusion of soil survey information versus other public information. Keeping a relational tie of a separate data base would still allow an information exchange. Any other data included would also have to be updated and maintained by the soil survey data base manager, leading to more responsibility for data accuracy.

Response 9 - Data needed include:

- crop yields
- landscape position including aspect and portion of hill slope "on the upper one-third part of convex side slopes.

"Yes, soil fertility data and engineering data in state and private films should be a part of a national soil survey data base, or at least be accessible electronically.

Response 10

In looking beyond 1990, I would believe that the use of Geographic Information Systems will become increasingly more important. Users need to know where this information can be obtained. Also, with the water quality issue becoming increasingly important, those institutions and laboratories which provide chemical data such as phosphorus and nitrate levels in water and show how they relate to the soil may become more important.

Response 11

Any type of data that can be tied directly to a map unit can be a valid addition to a relational soil survey data base. It is important to know where and how the data was gathered to be of any value. Any soil fertility, engineering test data, or geomorphic data could be a valuable asset to the state soil data base.

Response 12

What kinds of soil survey data bases will we need for mapping unit interpretations to support the long-range soil survey program beyond 1990?

We will no doubt have need for more data bases than we have time to develop and manage. We need data bases on mapping units for:

1. composition of map units in terms of similar and dissimilar soil.

2. composition of map units in terms of landscape components and topography variance.

3. soil properties - i.e., drainage, permeability, intake rate, ph, etc. Need representative physical and chemical laboratory data.

4. soil productivity - crop and, dryland and irrigated, range productivity, woodland site information.

5. soil fertility data.

6. engineering test data.

7. climatic data.

8. soil pedon descriptions.

9. data bases on various kinds of soil interpretative groups, i.e., windbreaks, capability units, hydrologic groups, etc.

10. Iowa has a soil survey map unit data base which includes a number of values beyond what is on the Soils-5. They have been working on this ***data set*** for several years. Much of the coordination has been done by Dale Lockridge at Ames, Iowa.

The SCS CAMPS Program will include a portion of these data bases, however, it will be quite limited on providing data bases to many potential users. It would be advantageous to include soil fertility and engineering test data from state and private laboratories in our data sets. However, a very strong effort and time input would be needed in evaluating these data to determine how much could be effectively used.

Charge 2

How should the soil survey data be stored and retrieved? Is there a need for state soil survey data bases to have a uniform formatted central core of data that can readily be accessed by adjacent state using the same soil series?

Response 1

The relationship data base is the most versatile format for storing and retrieving data. The SCS has initiated the state soil survey data base which is being developed in each state. This data base has a central core of uniformly formatted data for all correlated napping units in the state. At present, the data is not readily accessible by other states except through a letter or telephone call. The data can be copied and made available. There is a real‡ (Respo5o wo 3.9 be rete soil survey data bast will inpentn of)Tj 0.2596 Tc 4.178 Tw -0.48

Response 2

The data should be computer stored and retrieved, using a data base management system that **will** allow access by other state. Arrangement should be made to **access** directly those data stored within each University's laboratory.

Response 3

The soil survey data should be stored by series and/or SIR number in a menu drive relational data base. The soil survey data base should be stored in a central location or in a regional location. This would enable all users to access specific locations. In **addition** it would be a good idea to store all the soil series laboratory data at the same locations.

A uniform system is needed. North Dakota needs to have computer access to data for series from other states that we use.

Response 4

3SD should provide a uniform formatted state soil survey data base that can be accessed by adjacent state agencies outside **SCS.** Would need to have a UNIX operating system access.

Response 5

Access of series data generated in other states is essential to ensure consistency of correlation and interpretations among stats correlating the **same** soil series. The control core of this type of data base should revolve around the correlated series and storage and retrieval should be by series which could be subdivided by phases and tax adjuncts. (Variants could be handled as series.) This type of structural system could then be used to link the series data with the SCS-5 interpretations.

A 'standard' data base format with at least a uniform central core will be a necessity in the future. These data base not only will **serve** adjacent stats but will be accessed by people from outside the system with data retrieval needs. The more uniform the storage of the data the more available this information will be to the public and other governmental organizations. We are already seeing use of some of our data by fertilizer dealers, realtors, assessors, and planners. As more people become aware of the soil survey resource. demand for information will increase and ease of **access** will be vital to providing soil survey data. A data base compatible with Geographic Information Systems is also a **future necessity** if these systems are to perform at full potential.

Response 6

A uniform data base format will be necessary in the future if the data base is to be used to its full potential. These data bases should be regional/nation in scope to meet data retrieval needs of the future. The more uniform the storsge of the data the more svailable this information will be to the public and other governmental organizations. We are already seeing use of some of our data by fertilizer dealers, realtors, assessors, and planners. **As** awareness of the soil survey resource increases, demand for information will increase, making accessibility more vital. If Geographic Information Systems are to perform at full potential a uniform central data core is a necessity for these systems.

Response 7

As far as the State Soil Survey Data Base being used by the soil Conservation Service, there is a uniform format that can be used by any state to obtain information. I believe any data that we obtain from other sources would be best used on an R-Base system that can be used by stand alone computers in the field. We plan to use this method in downloading our state soil survey data base to soil survey offices for use on the Michigan Department of Agriculture computers.

Response 8

How should the soil survey data be stored and retrieved: Geographic Information Systems (GIS) will expand in most states. There needs to be one central unit within the state that will have the responsibility for storing digitized soil survey data and the soil interpretation needed for each soil map unit. This will more likely be a state agency rather than a federal group to store the central data set.

A strong need exists to store data in a format that is readily accessible. Soils data in CAMPS will be localized but in an accessible format for selected users.

Some data bases presently exists which can be accessed by states are 1) official series descriptions, 2) National Soil Survey Laboratory data, 3) oils-5 data, 4) to a limited degree crop yield data. 5) soil classification records and national lists of hydric soils.

Charge 3

Identify ways that encourage or enhance the exchange of data base information among NCSS cooperators.

Response 1

A common data dictionary as eluded to in charge 1 and a national soil survey data base available to everyone are very important to encourage the exchange of data base information. Most individuals, researchers, universities, and government agencies would be interested in contributing information and data if the procedure also benefits their own programs. A useful national data base or data bases will encourage university and government agencies to spend the time and money to add their own data to the larger national data base.

Response 2

The best way to encourage or enhance the exchange of data base information among NCSS cooperators is to maintain close working relationships. One way to accomplish that is through joint projects.

Response 9

Data Base Information can be exchanged following memo's of understanding between NCSS cooperators.

Response 10

In Michigan we have a committee set up to develop a form to send to all cooperators in the soil survey program. The form will be used to inform cooperator what data they have available and in what format it is available and who would be the contact person for obtaining the data. I would imagine a similar form could be developed on a national basis for all NCSS cooperators.

Response 11

If the data is stored in a uniformly or matted manner, that in itself will enchance the exchange of data.

Response 12

Identify ways that encourage or enhance the exchange of data base information among NCSS cooperators.

Communications and cooperation are most critical if we are to move forward. The differences in kinds of computers and the ability to timely exchange data between groups is often a problem. We need to make every effort to store data in a format that enhances data retrieval. There may be a need for NCSS in the Midwest to have a standing committee to assist in this coordination and exchange of data bases.

Charge 4

Identify the academic needs in computer science and related courses at the undergraduate and graduate level for students who wish to pursue a career as a professional soil scientist in our modern day technology. Goal is to provide guidance for curriculum and counseling of students.

Response 1

At a minimum, the course of study for professional soil scientists should include basic introduction to computer and data bases. One or two courses in programming are also desirable. If national data bases were readily available as advocated in charge 3, and instructors of even basic soil course could incorporate data base information problems into their course. Advanced data base use courses could feed off of the national data base.

Graduate programs should encourage candidates to record their thesis problem data in data base format and in some instances require this approach.

Response 2

The academic needs in computer science at the undergraduate level are somewhat different from those at the graduate level. Students at the undergraduate level and those at the graduate level, with little computer skills, should focus on the basics such as operating systems and various software packages such as word processing, spreadsheet. and a data base management system. If scheduling permits, then an introduction to programming, system administration, and data base design would be **desirable.** Related courses should include statistics for the biosciences.

Graduate students who have fulfilled the basics should pursue advanced programming in at least one common language, computer statistics, and advanced data base design and systems administration. If available, an introduction to GIS would be beneficial.

Response 3

At the undergraduate level, as a minimum, one basic course in computer science and programming. This should be coupled with at least one other course oriented to direct application. Graduate students need the basic knowledge indicated above and additional courses on different programming languages and software use.

All undergraduates in all fields need courses in basic computer science with emphasis on spreadsheet, data base, word processing and statistics, with some training in programming.

Response 4

An introductory course in computer science with follow up of data base management would be a minimum prerequisite. Computer knowledge will be necessary for soil scientist to enter and retrieve data from soil data bases. Soil maps and information about map units will be entered.

It would seem that academic computer training for future soil scientists could be broken into three components. The first component would be hardware familiarization and operation. The second component would be software operation with emphasis on data and spreadsheet structure and maintenance. The third component would be dsta base and spreadsheet operation to produce report and manipulate data.

Response 5 - Academic needs in computer science and related courses.

The future soil scientist will be called on to have a greater expertise in the computer world. Requirements in computer science courses would enhance a person's ability in the future. Also some type of training is needed in logical thinking and problem solving. This is probably one of the most neglected areas in education, and yet would aid almost anyone in solving many of the problems both computer related and as a soil scientist in the field.

Response 6 - Academic needs in computer science and related courses.

Training and skill are needed in **logical thinking** and **problem solving.** This would **benefit** the individual both **in** the **understanding of** the existing data bases and the logical creation of relational data bases in the future.

Response 7

This is a harder charge for me to answer since I had no computer courses when I was attending college. I obtained what I know on the job. From my observations I would think that soil scientists do not have to be programmers, but should know how to use computers to access soils information and to manipulate it. Knowledge of DOS would be essential. They also should be familiar with relational data bases, and word processing as well.

Response 8

The universities need to have available courses in design and management of data bases. Just learning how to run a commercially available program is not enough. There isa need to understand the basis of how to design a data base, what elements should be stored, and how should the data be linked together.

Response 9

Recent soil scientists we have employed in Nebraska are much better prepared and willing to work with soil survey data bases. The curriculum in soil science needs to require as a minimum, basic courses in use and understanding of computers. The present day soil scientists need to be able to effectively use computers and have an appreciation for how computers function.

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE

NORTH PLATTE, NEBRASKA

JUNE 1988

REPORT OF COMMITTEE TWO

SOIL INTERPRETATIONS

Charge 1

1. **Discuss soil property data that should be used in modeling (average,** range, modal).

2. **Where should data** originate (laboratory, **SIR, research)?**

3. **What should the number used in modeling represent?**

---

1. The SIR is the standard reference for soil prooerty data.

2. Soil property data should originate with the SIRs, our best data.

3. States are encouraged to improve data, i.e., ranges, on SIRs; **then use** ranges in modeling.

Yodeling should be based upon groups **of soil** properties rather than a single prooerty--i.e., landscape position, stratigrapny. For modeling, use **SIR** data (ranges) **along** with soil maps and text narrative.

Source of values for SIR should, where available, be presented, i.e., implied vs. derived.

The **number used** for modeling should be the maximum hard data available. States are encouraged to refine and improve SIR data as on-going responsibility. **Include,** where known, the degree/percent of reliability of SIR data.

For reference, individual responses from committee members becomes Attachment 1 to this report, Dr. Flach's article "Modeling **and Soil Survey" becomes** Attachment 2.

Cnarge 2

Principles and techniques of making Soil Potential Studies is well documented; however, use is limited.

Identify now to enhance effective use of SPS.

What degree, involvement, and documentation is needed?

There was general agreement and support of SPS **concept** and use. States should prioritize SPS work along with other work. It was recognized that **FSA is** nunber one yet we must look beyond **FSA** and prepare for future needs.

SPS requires servicing--maintenance and updating to reflect economic changes and new technologies. **We need to** provide technical staff to work with users **and** user groups. Documentation used for **SPS** should be maintained in SCS **Field Offices.**

It is recommended **that** NSSC circulate **status** reports of SE work to all states on progress, involvement, and tyoe of SPS. This would help **many states and avoid** duplication of effort: i.e., agricultural and non-agricultural SPS work.

As first priority, use personal involvement of contractors, suooliers, etc.; however questionnaires could be used for economic factors. Consider multi-county/resource area SPS's; yet personalize to individual counties as much as possinle.

Use existing SPS as references for adjoining counties for outlines and guides. **Use a** detailed soil survey as a technical reference when preparing SPS.

Initiate SPS **work** during **tne** project soil survey, through steering committees, so as to caoture readily available technical staff and keep interest strong after the survey is completed.

Charge 3

How can soil survey data be related to water quality?

Reliable soil pedon data extends to about two meters. How do we relate this data to often thicker geologic material?

We need to identify and interpret all soil properties important to water movement and. water quality; i.e, CEC, soil structure, hydraulic conductivity, B.D., organic matter, clay mineralogy, particle size distribution, and landscape elements.

Consider, collectively, all available soil survey data when working with water quality interpretations/studies.

SIR data alone is not believed adequate when

Charge 4

Discuss academic training needed for making soil interpretations by students who become soil scientists.

Relate need for basic science courses as they provide a background to make quality soil interpretations.

There was a consensus of committee members and those attending the discussion on Tuesday that a balanced curriculum of soil science courses totaling a minimum of 15 semester hours should continue as the basic technical, undergraduate preparation.

Universities are encouraged to emphasize courses in computer science, technical writing, communication skills, water quality, and Sociology for soil science majors. Soil science majors should be able to analyze, think independently, and solve problems.

Use undergraduate courses tnat would include soil mapping and field work--i.e., describing soils.

New professional employees should recognize the need for flexibility within their professions--i.e., field mapping, technical services needed for non mapping positions such as Resource Soil Scientists and state staff positions.

Employing agencies should use SCS available individualized training plans for new employees. Such plans would include hands-on work in other disciplines and serve as the final polishing in additional areas such as comouter work, technical writing and communication skills.

As reference, the Northeast Work Planning Conference reoort on Soil Survey Training Courses and curricula for Soil Scientists becomes Attachment 3 to this report.

Recommendations of Committee Two

1. We recommend to continue the Committee on Soil Interpretations and stay active between 1983 and 1990.

2. We recommend the following subject areas be considered as charges for th? 1990 WPC:

   a. Identify and prepare soil interpretation guides for new soil interpretations needed in water quality research and studies.

   b. Soil interpretations databases should be formatted so as to be linked as a relational database with our national/GIS database program.

   C. Include work and subject matter of soil map units and landscape units from Committee 6 as a part of Committee 2.

Respectfully submitted

Keith Huffman, Chairman

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE

NORTH PLATTE, NEBRASKA

June 1988

COMMITTEE TWO

SOIL INTERPRETATIONS

Charge 1

1. Discuss soil prooerty data that should be used in modeling (average, range, modal).

2. Where should data orginate (laboratory, SIR, research)?

3. What should the number used in modeling represent?

P. Johnson, SSQA, Lincoln:

1. Only experience with computer modeling has been validation of EPIC model. EPIC used single values that were obtained from laboratory data. We do not have laboratory data for every series and phases of series. The only nearly canplete data set available is the SIRs. SIRs are prepared using laboratory data for the series where available and estimating soil property data using similar soils when data is not available. I recommend that data from SIRs be used for modeling. For consistency, recommend using average for SIRs. What is modal for a soil varies from one soil survey to the next so modal values would be difficult to determine; however average values can be obtained from SIRs.

W. Lynn, NSSL:

1. Modelers have two choices:

   a.' Select properties for which a data base is available.
   b. Select other properties and wait for a data base.

   A description end characterization data base should be developed for each series--hard numbers. Entries for each property should be the best data or estimates available by people knowledgeable of the soil. The entries are tested and modified as warranted as additional hard data are 'gathered. This collectiokn of "best data" should be offered to the modelers.

Charge 1 (continued)

R. Tummons/P. Minor, Missouri:

1. Soil property data used in modeling should be based on typical or modal site. Typical site is determined by trained soil scientists and based on field experience. Considerable time is spent collecting data to support the modal concept of the soil. Modal site represents majority of acres mapped. It is the most practical soil property data that can be used in modeling.

   Averages and ranges are less desirable. For example, a soil scientist may decide that a soil has 30 to 35 percent coarse fragments; mainly cobble size throughout the profile. A pedon with the representative amount of coarse fragments is selected for a modal site. The range may allow 0 to 35 percent, including gravel, throughout the profile. In this case, an average based on the range of the series would not accurately show the true concept of the survey area.

   Data used in modeling should cone from the best source available. Laboratory data is useful, but is not always available. SIR is the best source of data for most uses. SIR data is based on field observations, lab data, and research. In some instances, data may need to be narrowed to fit a specific geographic area.

R. Bigler, Minnesota:

Combination of modal and range should be used in modeling. Modal needed to represent central concept. Range needed to account for actual range or properties.

Select data for modeling from all available sources after reliability has been examined and accepted. Good, reliable data on many soils is lacking. We should explore all possible sources of data. At ter model has been developed, follow up studies are needed to enhance the model and increase reliability.

B. Ritchie, Ohio:

1. The range should be used for modeling soil property data.
2. The data should come from laboratories and SIR.
3. No knowledge of what the number used in modeling should represent.

Charge 1 (continued)

J. Doll, Illinois:

1. Data should be widely available-probably SIRs have the greatest distribution and use; NSSL pedon data bank is another source.

   Average of SIR ranges should represent the modal concept. Some models may work best when lab data (singular or averages) are used.

   Data should represent values that are easy to determine or that are predictable from soil morphology.

J. Gerken, Dhio:

The modal concept of the series should be used for modeling purposes. Data should cone from SIRs. Lab data and research data may not reflect a true modal concept unless the purpose of sampling can be determined for all samples and inappropriate data removed. The number used in modeling should represent only an example of what the series represents. In using modeling data, would want to see a model of the typical extremes of the series--i.e., the end points of the range shown on SIR.

L. Tornes, Ohio:

Most soil property data used in modeling should come from laboratory data on the typical pedon for the series. This pedon represents the central concept of the series. If laboratory data for a series is not a reflection of the central concept, another pedon should be selected to represent the central concept.

If laboratory data (characterization and physical) is not available, an average of the range on the SIR should be used.

Using the range of all data on the SIR gives too broad a range for modeling.

R. Mapes, Ohio:

Using averages from SIRs can be misleading; i.e., pH of subsoil may range from 4.5 to 8.4--upper to lower.

Suggest using actual data of "representative" soils.

Charge 2

Principles and techniques of making soil potential studies (SPS) is well documented; however use is limited.

1. Identify how to enhance effective use of SPS.
2. What degree, involvement and docwntation is needed?

P. Johnson, SSQA, Lincoln:

Development of SPS should increase as the number of soil scientists involved in basic soil services increase. The need for SP studies in a county or area must be determined. Users have to be involved in the development of SP studies or they will not be used. Documentation is need, as discussed in NSH, and the procedures in NSH should be followed.

W. Lynn, NSSL:

Use of soil potentials is a matter of administrative decision, it seems to me. Technology has been defined and demonstrated adequately in pilot projects, e.g., in Florida, in Texas, and by the Histosol task force. Further deliberation seems superfluous inless the committee wants to make a formal request to switch to soil potentials.

Arguments for implementation of a numerical rating system include the separation of rating criteria from classes and the flexibility to choose the number of classes to best fit the situation being interpretated.

R. Tummons/P. Minor, Missouri:

A high degree of local involvement is important for a successful soil potential study. The initiative to start and conduct a study has to come from people familiar with local needs. Studies initiated at a higher level may be viewed as another job being shoved on the field staff rather than a project that will benefit the local area. The local people should feel that it is their study to complete.

The involvement of various disciplines in providing soil potential ratings is Important. In studies where this involvement is weak it is usually due to a lack of priority rather than a lack of interest. Managers should be made aware of the needs of the study early in the planning stage to ensure that the proper specialist will schedule time for the project.

More research by agencies such as ARS and AES is needed to improve the methods of developing workable alternatives. The cost/benefit ratio needs to be considered by researchers. Soil potential ratings that are not financially practicable will not be used. Research grants may be needed in order to give soil potential studies a higher priority by research agencies.

Charge 2 (continued)

R. Tummons/P. Minor, Missouri: (continued)

As soil surveys are completed in more and more areas, the need for soil scientists to sell the concept of soil potential ratings will increase. Existing studies can be used as examples to show the benefits of SP ratings. Soil scientists will not only need to sell the benefits of SP studies to various users, but will also need to convince the management of their own agencies to provide support for these projects. Use of SP studies will increase only if people are made aware of their benefits.

R. Bigler, Minnesota:

1. The use of SPS will increase as emphasis for new soil mapping lessens and soil interpretations/uses increase.

   a. Today's users are demanding more information and documentation. If documentation used for SPS is presented to the users, the use of soil potentials will increase.

B. Ritchie, Ohio:

1. SPS is a valuable tool for basic soil services. SPSs can be used to gain exposure to various user groups; i.e., soil potential is an excellent opportunity to establish a working relationship with local health departments.

   SPSs can be promoted through local steering committees.

J. Doll, Illinois:

Potentials will be used to a greater extent when users realize they are "tailored" interpretations.

Users need to be involved so SCS has a full understanding of local needs--SCS needs to be involved because we have the soil expertise.

J. Gerken, Ohio:

Until enough resource soil scientists are available to handle more than necessities in an area soils program, do not expect to see a big increase in the use of SPS. The resource soil scientist needs to educate field office personnel and user groups before an increase will take place. Until field office personnel become very familiar with the process of SP, participation at the area level will need to be extensive. Participation from the state office can be very minimal after area soils staff have conducted one or two studies. Documentation should be maintained at the current level. Although use of this documentation may be minimal during the useful life of a soil potential study, it could be invaluable when a study is updated.

L. Tomes, Ohio:

Development and use of SPS could be greatly accelerated by making this high priority work by resource specialists. We have only tapped the surface on the development and use of SP.

People involved in the use of SP ratings should be involved in the development. Outside sources should be tapped for documentation through interviews, questionnaires, etc. for example, not many installers of septic tank absorption fields have time to spend meeting with groups developing ratings: however, they would be happy to provide estimates on cost of installing systems for different soils. Enough documentation is needed to make good SP ratings.

R. Yapes, Ohio:

Enhance effective use of SPS through active program of Resource Soil Scientists.

Charge 3

1. How can soil survey data be related to water quality?

2. Reliable soil pedon data extends to a depth of about two meters. Row do we relate this data to the often thicker geological material in evaluation of nitrate movement and other contaminates to groundwater?

P. Johnson, SSQA, Lincoln:

As research is capleted that ties soil property data to the movement of soil additives that affect water quality, our soil scientists should be trained to predict the possibility of water supply pollution. They (soil scientists) should be trained to predict using soil properties which soil additives can be used on which soils safely and which cannot be used safely. Although we do not usually describe soils deeper than 2 meters, information is usually available about geologic material deeper than 2 meters from other research. Water movement in deeper strata (as ident. by other sources) can usually be predicted from soil properties that we describe and measure.

W. Lynn, NSSL:

Any thorough system of monitoring deep sections awaits an administrative decision. Soil science can do research and characterization on response of soils to solutes in saturated flow, but especially in unsaturated flow. If suitable methods are available in the literature, experiment stations and the NSSL should be charged with collecting data on solute absorption of selected anions, cations, pesticides, herbicides, etc., as part of the collection of characterization data.

L. Brendt, Michigan:

Suggest publishing a surficial geological map in the soil survey. Such a map could be a joint effort between SCS and state geological surveys.

Many observations below 2 m. are lost when the project staff leave the county.

More intonation could be added to map unit descriptions; particularily where confidence levels are high.

i.e., "In __________ township, the clayey ___________ soils are underlain by sand below 60 inches.

Charge 3 (continued)

R. Bigler, Minnesota:

1. Presently, we give data as to whether the bedrock is hard or soft; however, for water quality, the degree of fracturing is more important. Perhaps we could address fracturing of bedrock in our SIRs.

   Another area of concern for water quallty is ground water flow. In some materials, this flow can be determined by using topographic maps. Combined with the soil survey, this could be developed into a useful tool for determining lateral groundwater movement.

2. A good understanding of the upper 2 m. of soil is the most critical factor in controlling groundwater contamination. It is through this layer that most contaminants must pass.

R. Tummons/P. Minor, Missouri:

At least two models, GLEAMS (Groundwater Loading Effects from Agricultural Management Systems) and PRZM (Plant Root Zone Model) predict the rate and amount of oollutant transport through the soil profile. PRZM supposedly allows computation of pollutant transport to the water table which may be in the soil profile or below it.

Soils data used in these models include:

saturated hydraulic conductivity
soil evaporation parameter
field capacity
fraction of pore space filled at field capacity
soil porosity
immobile soil water content at 15 bar tension
initial abstraction coefficient for SCS curve number
two condition SCS curve number
maximum rooting depth
plant--available soil water storage for each of 7 storages
organic matter available for denitrification
soil nitrogen
soil phosphorus
potential mineralizable nitrogen
Potential water use
weight density of soil
fractions of clay, silt, sand and organic matter in surface soil layer
specific surface area of clay, silt, sand and organic matter particles.

Some of these data can be obtained from the SOILS-5 and other from laboratory analysis.

The USGS has a number of models that handle pollutant transport in geologic materials. Computer linkages between root zone models and aquifer models are being developed. The subroutine concept should

Charge 3 (continued1

B. Ritchie, Ohio:

1. Soil survey data is a part of the DRASTIC program for protection of groundwater. Fragile soils can be identified. More knowledge of soil-chemical relationships-i.e., fertilizers, herbicides, and insecticide movement in soils as related to the effect on groundwater should be developed. Soils are related to geologic landscapes. Soils can be a clue to the movement of nitrates and other contaminants in underlying geologic materials.

Potential problem areas can be identified through existing soil maps and well logs. Without site specific deep borings, it may be difficult to evaluate deep geologic materials. This can be costly.

J. Gerken, Ohio:

Research projects are needed to establish reliable base data to start. These data may exist for some situations, others need to be investigated. From these data, computer models can be set up and a host of projections can be made. Projects should also be set to check modeling that is done to provide "ground truthing." Any relationship that is established between soil data and geologic data will only be reliable to the extent it can be tested. Because of variability of materials involved, this type of relationship may only be used to establish an expected range of how a particular contaminant will act on a particular geologic deposit.

L. Tornes, Ohio:

Soil scientists can relate soil survey data to water quality; however, other disciplines will not accept and use the information. They say any interpretations greater than 80 inches are outside the range of normal observations by soil scientists. Some of the dense tills, for example, such as in Blount and Glynwood soils are so dense that with agricultural drainage, very little water eventually reaches the aquifer below. In areas where soil scientists know the till is greater than a certain thickness, i.e.-Auglaize County where bedrock is at depths grater than ten feet over all the county, soil scientists can make deeper interpretations.

There is concern that national programs like DRASTIC gives soils so little credit in the evaluation of potential groundwater pollution.

R. Mapes, Ohio:

Soil survey data should be a part of the formula as referred to in "DRASTIC" program by R. Petty.

Charge 4

1. Discuss academic training needed for making soil interpretations by students who become soil scientists.

2. Relate the need for basic science (math, chemistry, physics, engineering) courses as they provide a background to make quality soil interpretations.

P. Johnson, SSQA, Lincoln:

Training of soil scientists to make soil interpretations would include:

soil mechanics
soil engineering
sanitary facilities
soil chemistry (including new chemicals)
soil physics

A prerequisite to the above courses would include all basic science courses as a part of the soil scientist curriculum.

W. Lynn, NSSL:

The same charge can be addressed to "training" with the SCS. We have yet to develop a course to teach interpretation information to soil scientists and district conservationists in the SCS. We have nothing in interpretations to parallel the courses in correlation and soil lab data. Universities should develop the abilities of students to think, reason, evaluate, and solve problems--and to teach students where and how to look for background information.

The application of interpretations in the final analysis is site specific. If the univerisities can teach how to take the background--general guidelines and recorded experience--and apoly it to the case at hand, we will have the best odds of reaching viable interpretations.

R. Tummons/P. Minor, Missouri:

1. Basic science courses are essential for understanding and interpreting soils. Courses in engineering and Soil mechanics would be useful in order to predict soil behavior. Chemistry and physics courses will help to understand the role of soil as a medium for plant growth. Courses in plant science, geology, economics and other related courses are useful. In addition, education and communication courses such as effective presentations, public speaking, and technical writing will help soil scientists present soil interpretations to various users.

Charge 4 (continued)

R.Tummons/P. Minor, Missouri:

2. In some cases, basic courses are not enough. They do not give enough information for a soil scientist to be proficient in all of the areas needed to properly interpret soil data. For example, adequate knowledge of the engineering practices needed to overcome such soil properties as shrink-swell, permeability, subsidence and compaction could require an entire semester or more of engineering courses. The same could be said for most academic fields. Unfortunately, it is not possible for a student to take all of the courses that would be useful in making quality soil interpretations. It may be that in the future, soil scientists will need to specialize in a specific area. Soil scientists could minor in forestry, crop science, range or engineering. They could then work in one of these areas.

L. Brendt, Michigan:

2. Soil chemistry
   Soil physics
   Course on groundwater

R. Bigler, Minnesota:

1. Soil scientists need a well rounded education in all basic sciences. It is not only necessary for such an education to make sound interpretations, but also to help one realize when to consult other specialists before making a soil interpretation.

2. Soil Chemistry
   Soil physics
   Geology
   Botany
   Statistics

B. Ritchie, Ohio:

1. A soil scientist on basic soil services should have training in the following areas:

   communication skills
   effective presentations
   soil interpretations
   Interpretations and using lab data
   working with individuals and groups
   resource planning
   computers
   time management
   understand users needs
   soil mechanics
   salesmanship
   public relations

Charge 4 (continued)

B. Ritchie, Ohio:

2. Courses needed would include:

math
basic sciences
basic engineering
communications
social sciences

J. Doll, Illinois:

2. Math-through calculus and analytical geometry.
Chemistry--quantitative and qualitative analysis, organic.
Physics--one semester.
Engineering--civil engineering, soil mechanics, hydrology.

Students need a good background in math, chemistry, soil physics, and soil engineering to make soil interpretations. Without the educational background they do not have the necessary background and cannot make good estimates of bulk density, Atterburg limits, percent passing sieves, Unified and AASHTO classifications. As a minimum, soil scientists need:

2 courses of college math.
2 courses of chemistry (qualitative and quantitative).
1 course of organic chemistry.
1 course of soil physics.
1 course of physics.
1 course of soil engineering.
1 course of urban land use planning.

2. In addition, soil scientists need course work in:

soils
crops
botany
zoology
soil survey field work

Charge 4 (continued)

Jon Gerken, Ohio:

2. A solid science background would be desirable for a person working closely with soil interpretations. A list of courses would include:

   geometry
   algebra
   trigometry
   quantitative and qualitative analysis
   organic chemistry
   physics
   soil mechanics
   statistical analysis

   In addition, the student should have a solid background in soil science, i.e.--soil morphology, soil chemistry, soil physics, soil microbiology.

   A rudimentary background may be acceptable to apply soil interpretations; however, to develop soil interpretations, the student should be very solid and as diverse as possible.

L. Tornes, Ohio:

1. Students need a good background in mathematics, chemistry, soil physics, and soil engineering to make soil interpretations. Without proper background, students will be unable to make good estimates of bulk density, Atterburg limits, percent passing sieves, Unified and AASHTO classification systems.

2. As a minimum, soil science students should have the following:

   2 courses in college math
   2 courses in college chemistry (qualitative & quantitative)
   1 course in organic chemistry
   1 course in college physics
   1 course in soil engineering
   1 course in urban land use planning

   In addition, they need courses in soils, crops, botany, zoology, etc. They also need soil survey field work.

Modeling Jnd Soil Survey.

Klaus W. Flach
Soil Conservation Service
Washington D. C.

We have paid a lot of Jttention to nodeling in the last few years Jnd modeling has been important in making new uses of soilsurvey information. Like most new Jnd rapidly ● uolving developments in any science, modeling has its ferventsupporters and its equally fervent detractors. Personally, I stand firmly in both camps. Modeling has bttn badly misused by many people in govrrnment Jnd in the universities. Models are bring used for purposrs for which they had never been intended Jnd model predictions • rr being treated as facts where they are nothing better than fancy guesses.

But I also hold the opinion that modeling represents one of the most exciting developments in soil science Jnd that through models we will gain truly basic understanding of soils Jnd unprtctdtnttd use of soil survey information.

Modeling is nothing new to soil science. Any good soil mapper develops a model of the relationship between Kinds of soils and the landscape and he 'maps ahead' using this model.. He usually has difficulties when he tries to verbalize such J model, lrt alone putting it into quantitative terms, but hr could not function effectively without it. Our classification systems are essentially based on classes superimposed on more or less intuitive models of the relationships among soils; the development of Soil Taxonomy was perhaps the most systematic and conscious effort along such lines.

Kinds of Models.

tlodtls may be classified into two broad groups, stochastic or statistical models and process or physical models.
In stochastic models relationships among experimental observations are put into mathematical form through statistical techniques. Parameters may be based on known physical relationships or they may be more or less arbitrarily chosen. Stochastic models can Only be used within the limits of the universe in which thry have been dtvrloped. Within these limits tney

Computers • llar us to develop more complex models and to execute them faster than was possible before. In fact, many if not most of the models that we are using now in soil science would be of only academic value if it were not for computers. The remainder of this paper will be restricted to computer processed models.

Computer science is developing rapidly in ways that will make modeling a very practical tool to the soil scientist in the near future. At the one extreme, large main frame computers are getting so fast and are getting such large memories that incredibly complex models of the three dimensional soil universe can be developed. At the other extreme, portable micro's can be taken to the field and answer reasonably canplrx problems on the spot. An exciting relatively recent development is Expert Systems or Artificial Intelligence which take much of the drudgery out of programming and make it possible to merge different models with reasonable effort.

Some Existing or Almost Existing Models Related to Soil Survey.

The heading of this paragraph reflects the author's longstanding association with modelers. Models will be o.k. to-morrow; they are rarely perfect to-day. Numerous models have been developed that serve soil survey or that use soil survey information. The following are a few examples:

1. Soil Moisture Regimes (Newhall) Model. A uery simple but useful model to estimate soil moisture regimes as defined in Soil Taxonomy. Originally developed for manual execution, it was adapted to cctnputrr processing later. The model was developed by SCS and later rewritten for FORTRAN by Dr. VAN WAMBEKE of Cornell University.

2. Chemical. Runoff, and Erosion of Agricultural Management Systems (CREAMS I and CREAMS 2) A field scale model to assess non-point source pollution and the effects of alternative management practices. CREAMS1 is operational, CREAMS2 will be soon. Primarily a process model, Soil information is used *in* terms of hydrologic classification of soils, curve numbers, and the K value for the USLE. Developed by ARS.

3. Erosion Productivity Impact Calculator (EPIC), This is a process oriented model to calculate the effect of erosion on potential soil productivity. The model is operational and is being used to prepare materials for the 1985 RCA report. It uses detailed pedon data for representative soil series as well as data on slope length, percent slope, etc. from the Natural Resource Inventory (NRI). The model is driven by a Weather Simulator' that simulates daily weather conditions over long periods of time. A diagram, showing the interaction of the various components of EPIC is shown in figure 1. It was developed by ARS scientists with strong support from ERS and SCS. An advanced version of this model, ALMANAC, is being developed for facilitating technology transfer between experiment stations and farmers in developing countries.

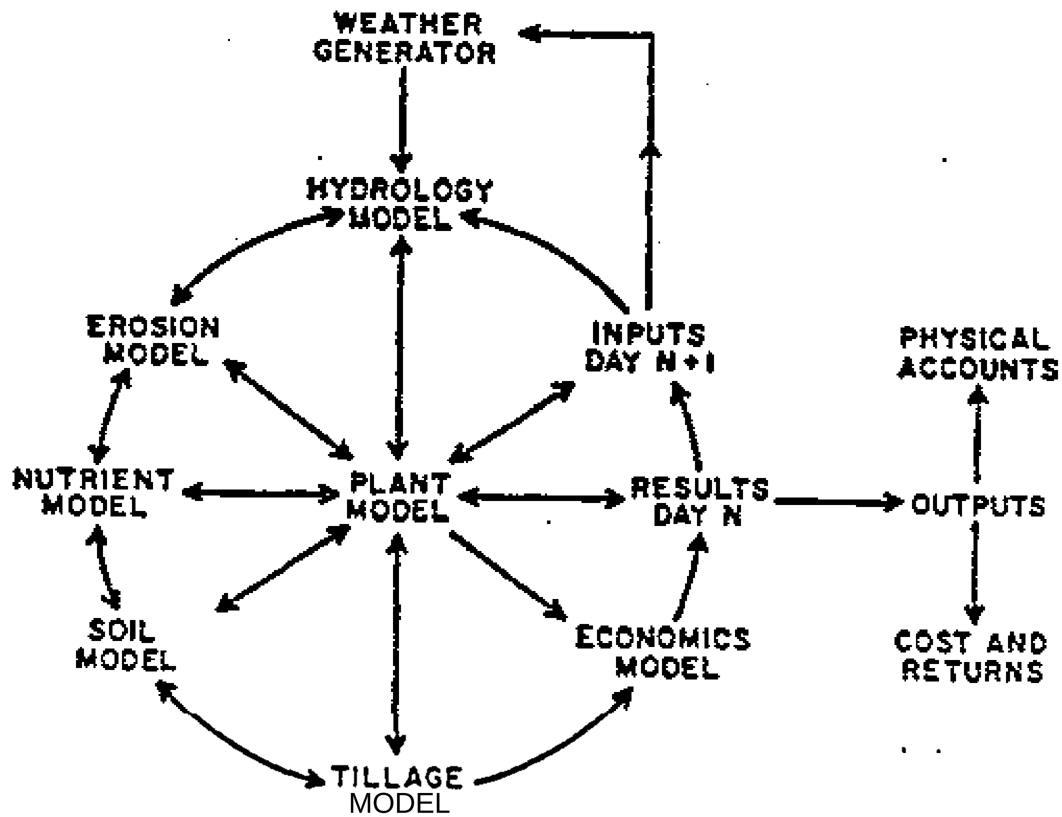

Figure 1 - System Linkage Diagram - EPIC

4. Productivity Index Model. (Larson Model) Like EPIC, this is a model to simulate the effect of erosion on productivity. Primarily a statistical model using relationships between soil properties and productivity that had been developed for a number of Missouri soils. The model uses soil information from the NRI, and means of ranges and other parameters from SOILS 5. The model has bren used extensively to simulate the effect of erosion on soil productivity in the Rid-West and in various other parts of the world. It was developed by an ARS/University of Minnesota team.

5. The SOILEC model. This model has been developed a the University of Illinois to calculate economic costs of erosion for designated kinds of soils and the costs and benefits of various conservation alternatives. The model uses information from SOILS 5 and from field observations. The model is operational and can be run on a IBM personal computer.

Numerous other models are being developed by ARS or by various Agricultural Experiment Stations. Some of them are operational in a research setting.

What Soil Survey can do for Modeling.

One of the most important contributions of modeling, so far, has been to demonstrate to soil scientists in other disciplines and to many pottntirl users the value and importance of soil surveys. Most renewable natural resource models nerd the kind of data soil survey can supply. At this point in time the SOILS 5 data base is used extensively by many groups cf modelers. But thcrr is increasing demand for more detailed data bases both in terms of soil properties and in terms of thr distribution of soils on thr land surface. Early modtltrs attrmptrd to develop systems that they thought would give thr best approximation of the real world without much concern for the ● urilsbility of data bases that would ● llau the usc of such models over large areas of land. This situation is changing rapidly now; modelers know that they must produce systems that can br used easily and this means using an available data base. And thrr have discovered that Soil Surveys are about thr only base ● uailablr.

What Modeling cm do for Soil Scirncr.

We should be grateful that modeling has contributed to a nrw ● pprrciation of the value of soil surveys, but modeling can do much more than that for soil survey and, looking at it more broadly, for soil scirnct.

For onr thing, modeling will allow us to make much btttrr and more sophisticrtrd intrrprrtations for many uses of soil surveys. Modeling will also help us to generate more prrcisc data on such soil attributes as moisture and temperature regimes. Actually, we have done much of this kind of thing ● lrcadr whrn we developed ● ccmputrri:rd inttrpretrtions' to help us complete SOILS 5's. Thost ● rr modrls, simplr perhaps, but they are.

Far bryond this, I bclitvt that modrls will help us to make soil science into a quantitative scitncr. Lord Kelvin said many years ago that a scirnct must be able to drfinc things quantitatively to dtstrvt being called a science. Until recently, thr systems we were dealing with seemed to be much too complicated for exact quantitative cxprtssion but computer modrling has changed this situation drastically. Using weather gcntrators like tht onr dtvtloptd for EPIC, and using models of water movement in soils that have btrn dtvrloprd for tht various hydrologic modrls, we should begin to be able to model proctssts of soil formation. There should be no difficulty in simulating 5 or 10 thousand years of soil formation. Wt should bt ● blt to explain why certain soil horizons occur in certain positions in thr soil profile and why thr distribution of organic matter or of bases in the soil profilr is difftrrnt under diffcrrnt kinds of urgrtation. And after we have ● nswtrtd some of tht relatively simplr questions of thr onr dimensional soil profilr, we should bt able to start ● ddrrssinQ thr interactions betwttn thrrc-dimtnsional soils with thrir thrrr-dimtnsional environments.

Some of these things may ● pprar rather ● cadrmic but I believe that they ● rr not. We will be ● skrd nort and more to predict how man's action is going to ● fftct the ● nuironmrnt. We ● rr bring ● skrd now, whether and how no-till, where we no longer incorporate residues in thr soil, will ● ffrct run-off and leaching as utll as organic matter content, soil trmprraturt and soil moisturr rcgimrs. Some of these changes may take many years and whrn we str the

Summary.

1. Models quantify; they help make a science out of a discipline.

2. Models test thr state of the art.

3. Models force interdisciplinary cooperation.

4. Models are only as strong as their weakest link.

5. Models can be no better than their data base.

6. Stochastic models cannot br extended beyond the universe from which they were developed.

7. Process models cannot br better than thr understanding of thr processes on which they are based.

8. Modeling of renewable natural resources requires a high quality roil survey data base.

9. Modeling tests and improves our understanding of what controls thr nature and distribution of soils.

10. Currrnt soil survey data are inadequate to model the movement of water into the soil and *in the* soil landscape.

11. Modelers nerd a data base representative of soil map units at various levels of generalization.

Committee Report

General:

There are no courses offered routinely that can substitute for daily field mapping experience. Those courses that are field based, i.e. soil survey, soil genesis, classification, soil judging, and field trips are all quite valuable but can only serve as an introduction to field study. If the research portion of a student's graduate program is a field study, this probably comes closest to mapping as anything. Study trips of several days duration can help but they cannot replace day to day field mapping.

Charge 1. Survey existing soil survey courses.

A questionnaire was designed to gather information to assess what courses relating to soil survey, soil genesis; land use, etc. were available through universities and colleges in the Northeast Region. In addition, questions were added to get the opinion of those involved at these universities and on the committee as to what soil survey field experience is needed, how much should be required, what opportunities exist within or outside the university system in a particular state, the levels of field training upon graduation from northeast universities within the past five years, where these individuals went to work, and the levels of soil survey field training of faculty at universities in the northeast region. The results of the questionnaire are included as Appendix A. Some of the conclusions from this survey are as follows:

- Course offerings:

  (a) Although six universities reported graduate level courses in soil genesis and morphology, no soil survey courses were offered for graduate credit.
  (b) Only four of those offering undergraduate soil survey courses included an outside (out of doors) laboratory or practicum.
  (c) There were eight universities that offered course5 that involved utilization of soil survey information, but none included an out-of-doors activity.
  (d) There were six offering graduate level soil genesis courses, five with some kind of outside laboratory or field trip.
  (e) Soil evaluation (soil judging) was offered by seven universities.

- All responses indicated field mapping experience was desirable for graduates majoring in the subject matter area.
- 8 of the 13 responses indicated field mapping was necessary for adequate job performance upon graduation.
- 5 of 12 responses indicated field mapping experience would give graduates in other phases of soil science an advantage in the job market.
- 4 of 10 responses indicated an opportunity for field mapping *experience* beyond normal course work and research.
- 63% (22/35) of the recent M. S. graduates had no field mapping experience beyond normal course work and research.
- 45% (5/11) of the recent Ph.D. graduates had no field mapping experience beyond normal course work and research.
- 37% (13/35) of the recent M. S. graduates had at least *one summer* equivalent of field work.
- 45% (5/11) of the recent Ph.D. graduates had at least two summers field mapping experience.
- 15% (7/46) of all advanced degree graduates were field trained equivalent to a GS-9 soil scientist.
- The employment of the advanced decree graduate was about evenlv split among university, Federal, and private employment and those continuing on with graduate studies. - A consensus opinon was that one summer's field experience was appropriate for an M. S. graduate and two summers were appropriate *for a* Ph.D. graduate.
- Of the faculty members at surveyed institutions, 81% (17/21) of the responses indicated at least 2 summers equivalent of field mapping experience when they entered the job market.
- It appears that faculties now on university campuses had more field training when they began their careers than do current graduates now entering the job market.
- General concern was that some level of field mapping experience should be required for M. S. and Ph.D. graduates in the subject matter area.

Recommendations:

Charge 1:

(1) That this data gathering questionnaire be made available to the Northeast Steering Committee where upon their discussion it could be sent to other regional conference steering committees as a way to assess the *training situation in* these regions.
(2) That the questionnaire be forwarded to ARCPACS for their information.
(3) That a paper concerning the results *of* this questionnaire be presented to ASA.

Charge   Define minimum training needs in soil survey at the graduate level.

The following comments are from committee members concerning minimum training needs:

A graduate should have some grasp of the following:

(1) The ability to recognize the geology and parent *materials* and their origin from field observations. The level of competency should be such that a variety of parent material *systems are* recognized.
(2) A recognition and working knowledge of landforms and geomorphic units.
(3) Some degree of appreciation of ecosystems, both flora and fauna, and micro and macro climatic systems.
(4) A working knowledge of soil morphology and nomenclature. The ability to recognize soil features, know what these features imply, and the ability to write a detailed soil description.
(5) The ability to integrate the above into soil-landscape-units to the extent that cause and effect can be ascertained based on soil features.
(6) The practice, or experience, of describing item 5 in narrative form, i.e. map unit descriptions.

The minimum training based *on* comments from committee members is three months field training for M. S. students and six months for Ph.D. students.

"The more (field training) the better within limits of completing programs without undue amounts of time."

"--a common problem with some people is their lack of understanding of how the soil surveys are made and the limitations *of* this information. They often have difficulty going from a soil series concept to a map unit concept ----- The tendency is to think more in terms of separate holes in the landscape. For the people that have experience in soil mapping, this is less of a problem and thus their ability to accurately use and interpret the soil survey information is greatly improved."

"Soil judging with peers will sharpen the student's ability to remember and compare observations of soil characteristics by competition and repetition. Therefore, students should have an active role in soil judging."

Recommendations:

(1) It is desirable to obtain a minimum of 3 months (or equivalent) field mapping experience for M. S. candidates and 6 months for Ph.D. candidates in addition to normal degree requirements.

Charge 3. Make recommendations as to how these needs can be **fulfilled.**

The following are suggestions from committee members with regard to recommendations for fulfilling training needs.

- The student trainee program with SCS is ideal - the problem is limited funds for the program on any continuing basis. This is normally available only to undergraduates but graduate students that were once employed by SCS may apply.
- A regional summer camp for soil survey training, similar to ones that foresters and geologists attend, could be set up and jointly taught by university and SCS personnel.
- Universities could develop a field mapping course but this would probably be difficult because of limited enrollment for each individual school, and if enrollments were small, university administrations would not allow it to continue.
- Universities should develop the course program at graduate or even undergraduate level.
- Regional approach - Have the SCS and experiment stations jointly run a summer field course (3 months) for all graduate students in the Northeast. It could be run from a university where cheap dorm rooms are available. Each school could give credit to their own students via special study.
- State approach - Have the SCS hire the students to map in their state or in adjoining states. The national or regional SCS offices should strongly encourage this action. With such encouragement it might happen.
- Encourage students that are interested in pursuing an advanced degree in soil genesis, survey, etc. to apply only to those universities that offer field mapping experience.
- Encourage those field soil scientists with the most potential to return to a university for an advanced degree.

- Require students applying for advanced degrees in soil genesis, survey, etc. to have field experience prior to being admitted into the graduate program.
- SCS has a volunteer program for anyone who wishes to participate which can serve as an alternative for universities that do not offer mapping experience opportunities.
- Marty Rabenhorst - Outlined a regional summer field course program to meet the needs. Suggested a 4-6 week program. Perhaps structured as a senior/graduate level course. Four credits? It is suggested the program be on a *regular* basis. The first camp could be held during the summer of 1986. The question of students paying for the course credits remains to be worked out. Some prerequists should be listed. Faculty reimbursement could be paid from enrollment fees.
- Bob Rourke - Maine is offering a similar course now. This is a three week course with student work based on eight-hour, five days a week. The course is divided into two phases. The first part is on soil morphology, and the second part is on field mapping. The course is open to undergraduates as well as graduate students.
- Will Hanna - It would be desirable to get out a letter to deans of the agricultural colleges to solicit their support in the concept of this course.
- Jim Baker - Ph.D. students would probably take this

Goals

(1) A summer trainee course should serve to develop *an* appreciation **of**

Appendix A

Results
Soil Survey Field Training

Questionnaire

NOTE: 14 questionnaires were returned, not all questions received a a response.

1. Which of the courses or their equivalents, are offered at your institution.

	Undergrad. Level	Graduate Level	Outside (out of doors) Laboratory
Soil Survey	6	0	4
Soil Genesis & Morphology	6	6	5
Utilization of Soil Survey Information	8	1	c
Soil Evaluation (Soil Judging)	7	0	7
Geomorphology	6	3	0
Other (____________________)	0	0	0

2. Do you think that field mapping experience is desirable for graduate students majoring in the above subject matter areas.
   yes 13
   No 0
   Comments:
   (a) "Even though we don't train specifically for that objective here."
   (b) "Essential for field evaluation, sample collection and interpretation."
   (c) "Not only desirable but probably should be mandatory."
   (d) "But how desirable?"

3. Do you think that field mapping experience is necessary for adequate job performance after graduation for these students.
   Yes 8
   No 5
   Comments:
   (a) "But would be a big help."
   (b) "Helps maintain field evaluation skills."
   (c) "Highly desirable but can be picked up post graduation if willing to apply oneself."
   (d) *Always desirable, but not absolutely necessary in all cases, it depends on the direction of their professional careers."

(e) "Particulary if they work for someone other than SCS."
(f) (yes) "But only if the individual is involved in mapping."
(g) "Without mapping experience, our students have had adequate job performance. Maybe they could have done better with some mapping experience."

4. Do you think field mapping experience would give graduate students majoring in other areas (i.e. soil chemistry or soil physics) an advantage in the job market?

Yes 5
No 7

(a) "It would be an advantage - but would this experience be more valuable than another specific course?"
(b) "(No) - perhaps some advantage."
(c) "Makes them more versatile - otherwise they are too lab oriented."

5. Are there opportunities at your institution for graduate students to obtain field mapping experience beyond normal course work?

Yes 4
No 6

(a) "It is becoming more difficult to provide this experience."
(b) "By special cooperative arrangement with SCS"
(c) "Generally no but occasional special projects may provide some opportunity."
(d) "There are opportunties but few have funding attached."

6. Are there opportunities in your region for graduate students to obtain field mapping experience outside the institution.

Yes 4
No 7
If yes, where? ______________________________

(a) "Not a real good mechanism for accomplsihing this at the graduate level. Occasionally Cornell is able to sponsor a graduate student for a few summer months with one of the field parties - Funds always seem to be limited for this kind of training. It is easier for SCS to provide this kind of training at the undergraduate level through the student trainee program."
(b) 'University of Connecticut (yes)"
(c) "We had one M.S. student do a special project with SCS (on a non-pay basis)."
(d) "None outside New York that are available to my students."
(e) "Private sector - experience may be quite different from a standard class II survey. Wetlands mapping, detailed (highly detailed) for on-site residential and commercial development."
(f) "(No) not that I'm aware of."
(g) "Some opportunity exists with the SCS summer trainee program but not on a regular basis - also some opportunity exists with private consultants for summer work."

Considering the following levels of field mapping experience when answering questions 7 through 11.

(a) None
(b) *Only* exerpience is with course work
(c) **Experience** equivalent to one summer (3 months)
(d) Experience equivalent to two summers (6 months)
(e) Experience equivalent to 6 months to 1 year
(f) Experience equivalent **of >1** year but not fully trained
(g) Experience equivalent of a fully trained field soil scientist **(GS9)**

7. For the past five year period (1979-1984) indicate the levels of field mapping experience for M.S. and Ph.D. graduates where major program emphasis was in soil genesis, soil survey, soil classification, utilization of soil survey information or soil evaluation.

Experience Level on Graduation	**M.S.**	Ph.D.	Totals
(a)	**0**	**0**	0
(b)	**22**	5	**27**
(c)	6	1	7
(d)	1	0	**1**
(e)	3	0	3
(f)	**0**	1	1
(g)	3	4	7
Totals	35	11	46

8. For Question 7 above, where did these graduates (M.S. and Ph.D.'s **go** to work for their first post graduate professional job?

	M.S.	Ph.D.	Level not specified	Totals
(1) College or university	bbg	ggb	3	9
(2) Federal employment	bbbbeeg	g	2	10
(3) State government **(4)** Local ***government***	**bg**	__	1 0	**2**
(5) Private sector	bbbd	fg	5	11
(6) Continued graduate studies	bbbcc	--	3	9
(7) Unknown	--	--	3	**3**
(8) Other ______________	**--**	--	__	--

9. What level of field mapping experience would you consider appropriate for:

M.S. graduates 2(b), **8(c),** 2(d)
Ph.D. graduates 2(c), 7(d), l(f)
Comments: ____

(a) "Obviously, the **more** the better within limits of completing

programs without undue amounts of time."
(b) "...e = optimum for M.S. and g = optimum for the Ph.D."

10. For faculty members currently at your institution whose major study was in soil genesis, soil survey, etc., what were the levels of field mapping experience upon graduation with the latest degree? (List *one* level for each individual - no names please)

1=a, 2=b, 1=c, 4=d, 1=e, 3=f, 9=g

11. **For** faculty members currently at your institution whose major work now is within the field of soil **geneis,** soil survey, etc., **what are** the present levels **of** field mapping experience? (List one level for each individual)

1=a, 2=b, 1=c, 3=d, 1=e, 2=f, 8=g

12. Should some level of field mapping experience be required for an advanced degree in the subject area of soil genesis, soil survey, etc.

M.S.	Yes	13
	No	2
Ph.D.	Yes	13
	No	

Additional comments in general:

(a) "Some of these questions were not easy to answer because this university has only two faculty with training in soil survey. One is the extension soil scientist, the other teaches the courses-related to soil genesis and survey but does little research in the area. Therefore, we have no graduate research program in soil genesis and/or survey at this time."
(b) "This is a real **problem.** As detailed soil surveys are completed in the northeast, opportunities even on a volunteer basis for training as part of the National Cooperative Soil Survey are becoming *very* limited. There are opportuniteis in Connecticut in the private sector, but this training received may be quite different from that which is typical of National Cooperative Soil Surveys."
(c) "The mapping experience may be gained while the student is an undergraduate."
(d) "Many of the above ***questions are of*** the 'do you love your mother' type".
(e) "Mapping experience is *an* absolute necessity *if* field consultation *is* provided within or outside of the job."

North Central Soil Survey Conference
North Platte, Nebraska
June 21-24, 1988

Committee 3 Report

Soil-Water Relationships

This Committee was formed to consider the three charges listed below:

1. Review the International Committee recommendations on soil moisture criteria and evaluate the impact on classification and interpretation of soils in the Midwest. Make recommendations to ICOMAQ.

2. Discuss the applicability and acceptability of using the NSH soil-water states in field operations and soil survey publlcatlons.

3. Review the definitions of soil moisture control section in Soil Taxonomy.

These charges were sent to the committee members for their response. The individual responses were duplicated and handed to the attending committee members for consideration and discussion by the committee from 3 to 5 p.m. on Tuesday, June 21, 1988, in the Buffalo Room at the Holiday Inn, North Platte, Nebraska. The committee members in attendance were:

Otto Baumer (Chairman)
Ron Paetzold (Vice Chairman)
Tom Fenton
Ivan Jansen
Dave Lewis

Also present were 16 conference participants that were not members of the committee. Nearly all actively participated in the discussions.

Recommendations by the Committee:

Charge 1. The shift of emphasis from wetness to color in the proposed definition of Aquic Moisture Regime was seen to most likely introduce controversy into the decision making process by obscuring rather than contrasting anomalous situations. The responsibility of color interpretatlon should rest with the classifier rather than with the taxonomy.

Recommendation: No changes in the definition of Aquic Moisture Regime.

Charge 2. Uncertainty of what to do with the soil water states, especially when used in teaching, was expressed. The most confusing aspect was seen to be the time dependency of the definitions. Good utility was seen in the descriptors of moisture states without the duration modifications. Perhaps only three states--wet, moist, and dry--should be considered.

Recommendation: Encourage field testing of description part and implement inclusion into soil survey report on trial basis.

Response of Committee 4
New Packaging of Our Information
1988 North Central Soil Survey Conference

Attendance:

Wayne Vanek	Scottsbluff. NE
*Steve W. Payne	Madison, WI
Alexander Ritchie	DNR, Columbus, OH
Keith Hoffman	SCS, Columbus, OH
Rex Mapes	SCS, Columbus; OH
Gary Lemme	SDSU, Brookings, SD
Jon Gerken	SCS, Columbus, OH
*Larry Tornes	SCS, Columbua, OH
*Bill Pauls	SCS, Columbia, MO
Jim Fortner	SCS, Rolla, MO
Rick Schlepp	SCS, Huron, SD
Louie Buller	SCS, Lincoln, NE
*Dennis Heil	SCS, St. Paul, MN
*Sam Orr	DNR, Jefferson City, MO
Ron Yeck	SCS, NSSL, Lincoln, NE
Larry Brown	SCS, NSSL, Lincoln, NE
Larry Ratliff	SCS, SSQA, Lincoln, NE
*Joe McCloskey	SCS, St. Paul, MN
Ron Kuehl	SCS, Des Moines, IA
*Neil Stroesenreuther	SCS, East Lansing, MI
Paul Minor	SCS, Columbia, MO
Bob McLeese	SCS, Illinois
Jim Thiele	SCS, North Dakota
*Don Stelling	SCS, Ft. Worth, NCC
Ray Sinclair	SCS, Indiana
*Don Last	College of Nat. Res., Un. of WI-Stevens Point
Tom Calhoun	SCS, Washington, D.C.

* Committee Members

As an overview, the committee would like to state that many of the ideas and suggestions expressed in the responses to the charges are with current user needs and technology level. However, we recognize that increased land use intensity, user awareness of information available in the soil survey, and new technological advances will bring modifications to these responses and, in some cases, could outdate current thoughts on packaging of soil survey systems. A comprehensive educational program will be needed to make user groups aware of the array of information in the various formats as well as to update soil survey personnel on technological advances in dissemination formats.

Charge #1 - Major areas of interpretation needs and data needs for the next 10 years. Assess the relevance of our current interpretations and data base for these projected needs.

A. Major soil interpretation data needed for the next ten years.

1. Groundwater pollution potential
2. Hazardous waste disposal potential
3. Reliable crop yield data - alternative crops
4. Woodland and wildlife suitability potentials
5. Soil compaction potential and properties relative to various tillage, planting and harvesting equipment
6. Soil conservation needs (Food Security Act)

There is a need to develop or have the potential to develop more soil interpretations than are currently In the National Soils Handbook. There is a need to develop regional soil interpretations based upon the different uses and management of various soils. We must not imply more interpretative value than what actually exists particularly in areas mapped at a broader level (i.e., woodland and rangeland).

Care must be taken to insure the correct interpretations are given when older surveys are recorrelated.

A map unit description enhancement is needed with the interpretations and data base to correlate more complete, user-oriented interpretations and recommendations. Although production agriculture is a major impact on the soil resource in the North Central Region, we should rethink the use of "marginal" when referring to the use of more steeply sloping lands in the NCR.

One great need will be training people to conduct on-site evaluations and explain interpretations to users. Presently little explanation is given. Better education of users of soil survey information is needed.

B. Data needed to make sound interpretations in the next ten years (listed in order of priority)

1. Water table studies - frequency, duration, location
2. Through-flow of water in various soil landscapes
3. Woodland and range site index
4. Crop yields - traditional and alternative crops
5. Atterburg limits
6. Available water holding capacity
7. Bulk density
8. Permeability
9. Soil adsorption potential - CEC, retention of various chemical constituents.

Care should be taken to cross-link the database and soil interpretations. The database should address interpretation needs rather than use for correlation and classification as it has in the past. In summary, there is a general lack of basic data. Most of the interpretations in the past have developed from a limited base and, sometimes, best estimates. More test data is needed to substantiate the accuracy of the interpretations.

Charge 2: Examine current trends and future needs in dissemination to users. What clientele will be utilizing the soil survey and what technology medias are, or will be available for dissemination?

A. Clientele that will be utilizing the soil survey - a wide range of individuals, agencies, etc. will be utilizing the soil survey (listed in order of priority):

1. Individual landowners - farmers, homeowners
2. Government agencies - federal, state, county, and local
3. Private consultants
4. Engineering firms
5. Builders, developers, and realtors
6. K - 12 educators
7. Tax appraisers
8. Environmental groups

An increased number of environmental concerned users are in the audience from both regulatory and educational agencies. Therefore there is a need to consciousness of delivering good sound data to agencies, etc. where information will be possibly used for legislation and regulation.

There is a need to communicate with soil survey users to recognize what information (i.e. raw data, interpretations, etc.) they need and in what form is it needed. Although the committee did not have access to the report it was stated that a survey of soil survey users conducted in the Northeast U.S. indicated relatively strong satisfaction with current soil survey information. However, if this is true, we cannot rest on our own past reputation.

B. Technological medias which are, or will be, available for dissemination of the soil survey information.

1. The computer was described by all members as the media of the future to disseminate information

a. Many support the use of microcomputer as the delivery system of the present and immediate future.

b. Some support the use of mainframe computer capabilities but realize the lack of availability to the general public.

2. Geographic Information Systems (GIS), digitized maps, and databases will probably be used in various combinations to provide users who have access to computers with various software packages. The implementation of various 3-dimensional display systems, CAD-CAM, etc. will assist in systematically representing soil landscape interpretations and information.

3. It is essential that one agency has the overall responsibility to coordinate the database development effort so to avoid each agency developing "the same database". All cooperating agencies should have input into the overall database program and have access to the database.

4. There is a need for communication to detail the efforts of different states to inform the other states. There is a need for a library (entity) of technology developed for databases. A newsletter or special informational section in a publication such as Soil Survey Horizons is needed to keep soil survey personnel updated on the development of databases by other agencies and states.

5. There will still, for some time, be a need for published surveys (hardbound) in text, interpretation tables, and soil map format for clientele without computers and software capabilities.

6. Compact disc technology is just "on the horizon". This format may foster the possibility to illustrate more informational formats to the user.

7. With the time, effort, and detail needed to make accurate information and interpretations to the public perhaps we should "charge" for any information we release to users. The public may accept this with more credibility.

8. The committee felt that with the broad spectrum of clientele groups and their diverse needs the soil survey information needs to be packaged in a variety of ways so information can be widely accessed. With this, is a large need to educate users as to how to access information.

9. Finally one committee member reminds us that "In this time of high tech let's not forget the advantages of personal, group, or one-on-one, human conversation and discussion".

Charge 3: Discuss the alternatives of packaging soil maps and interpretations for modernizing (updating?) older soil surveys. What types of soil maps will the user need (i.e., aerial photography base, computer generated map?)

A. Maps

1. Specific users will continue to use the soil map published on photograph base maps. These individuals will be users (such as real estate agents, conservation technicians) who use the soil survey on-site. This photo base background should be as current as possible and be of high quality.

2. Digitized (or computer generated) maps will be used by an increasing array of groups. Many users are not familiar with a photo background, therefore the lack of a background is not that important. Also users need to be aware of the limitations of a map "blown up" from scales such as 1:24,000.

3. The use of a "single-page" package for each map unit on an updated survey as developed in Minnesota. This package includes a brief description of the soil, a landscape diagram, appropriate physical and chemical data and specific interpretations for the use requested.

4. Rather than publish numerous copies of a bound report and maps, just provide a publication in a similar format without the maps. Provide maps only on specific areas of interest.

5. Why "reinvent the wheel"? In some cases our current package of interpretations and maps may be good for many intended uses.

6. When compact disc technology is refined an aerial photo background may be possible to present.

B. Interpretations

1. Soil parameters must properly be put into software used by other disciplines in generating other resource use guidelines.

2. Publish the manuscript of the soil survey in a "loose leaf form" for easier updating.

3. Education programs are needed to help users understand the wealth of interpretations and what they mean.

It is becoming more difficult to package soil survey information for users. What some users prefer or can use, other users want in another form. Therefore, a variety of packages will be needed.

Recommendations:

The committee recommends that Committee 4 be continued for the 1990 North-Central Soil Survey Planning Conference. This recommendation is based on the need for strong, coordinated databases as the foundation for interpretations and potential studies. The committee also recognizes that soil survey information has been and probably will be used with increased frequency for legislative and regulatory purposes. Additionally it is recognized that as technology changes the ways of packaging and disseminating soil survey data increases.

The committee recommends that these charges be taken to the National Soil Survey Work Planning Conference in 1989. Much of this request is based on increased use of soil survey information for regulation and legislation as well as the rapid change in technology relative to dissemination of soil survey information.

NORTH CENTRAL SOIL SURVEY CONFERENCE
June 20-24, 1988
North Platte, Nebraska

Committee 5 Report

Soil Correlation and Classification

Eighteen persons served as committee members this year. Committee 5 was assigned four charges by the Steering Committee.

__Charge 1.__ Consider proposed revisions for mineralogy classes in Boil Taxonomy,. Consider revisions proposed for definitions of the control section for determination of the particle size classes. Respond to issues raised by the National Task Force on Soil Family Category that was part of the 1987 National Soil Survey Conference.

Most of the discussion on this charge centered on the proposal by Dr. Ben Hajek, Auburn University, concerning soil mineralogy classes. This proposal was part of the National Task Force Report.

Recommendation:

The committee recommends further study of this charge with communication and coordination of effort between Committee 5 and ICOMFAM.

Charge 2. Reach a consensus as to the continued use of variants in soil correlation.

Recommendation:

The committee believes that the use of variants in soil correlation should be discontinued. The committee noted that this would probably require dropping the current requirement of a 2000 acre minimum extent in order to establish a new soil series.

Charge 3. Develop guidelines for application in establishing the geographic range of soil series.

correlation

used for current progressive soil surveys should also be applied to updates of existing soil surveys. The amount of documentation needed should be determined by the State Soil Scientist.

Overall Recommendations:

The work of Committee 5 is not finished, and we recommend that the committee be continued at the 1990 Soil Survey Conference. In view of current activities concerning revisions of the family category and the work of ICOMFAM, there is a need for Committee 5 to stay active. Several members thought that committee work should continue by correspondence until the 1990 soil Survey Conference.

A possible new charge for Committee 5 is to evaluate the classification of soils with cambic horizons.

Respectfully submitted,

M.D. Ransom
Chairman, Committee 5

North Central Soil Survey Conference
June 21-24, 1988
North Platte, Nebraska

Committee 6 Report

Landscape Analysis and Development of Map Units

Introduction:

Shetron is concerned about the definition of the word "landscape" which is contained in the glossary of terms sent to all committee members. He indicated that his responses refer to landforms and their morphology, or components, and not landscapes. Olson indicated that the charges were written and agreed to without the benefit of the enclosed glossary of terms. These glossary definitions are listed below. Anyone with improved definitions should submit them for committee consideration.

Landform - Any physical, recognizable form or feature of the earth's surface, having a characteristic shape, and produced by natural causes; it includes major forms such as a plain, plateau, or mountain, and minor forms such as a hill, valley, slope, esker, or dune. Taken together, the landforms make up the surface configuration of the earth. The "landform" concept involves both empirical description of a terrain (land-surface form) class and interpretation of genetic factors ("natural causes").

Landform element - A morphological part of a component landform. Hillslope landform elements may be divided into slope components.

Landscape - All the natural features, such as a field, hills, forests, and water that distinguish one part of the earth's surface from another part; usually that portion of land which the eye can comprehend in a single view, including all of its natural characteristics. (Geol.) The distinct association of landforms, esp. as modified by geologic forces, that can be see" in a single view.

Olson suggested landforms are often described as either erosional (carved by running water), or constructional (those formed by depositional processes such as ice, water or wind). Ruhe and Walker presented erosional landforms as geomorphic components of a hillslope including slope (Fig. 1A) and slope profile (Fig. 1B). Much of the literature has utilized to these terms (summit, shoulder, backslope, footslope. and toeslope). Other researchers have further subdivided them into landscape segments (upper backslope, middle footslope, etc). Since it is common for a hillslope to include both constructional and erosional landforms, one could use the landscape term to refer to the distinct association of landforms which we can see in a single view. Olson suggested another committee option would be to ammend the charges to include with the term "landform" as well as the term "landscape". Olson also indicated that slope shape needs to be considered and recommended using Ruhe's hillslope classification based on

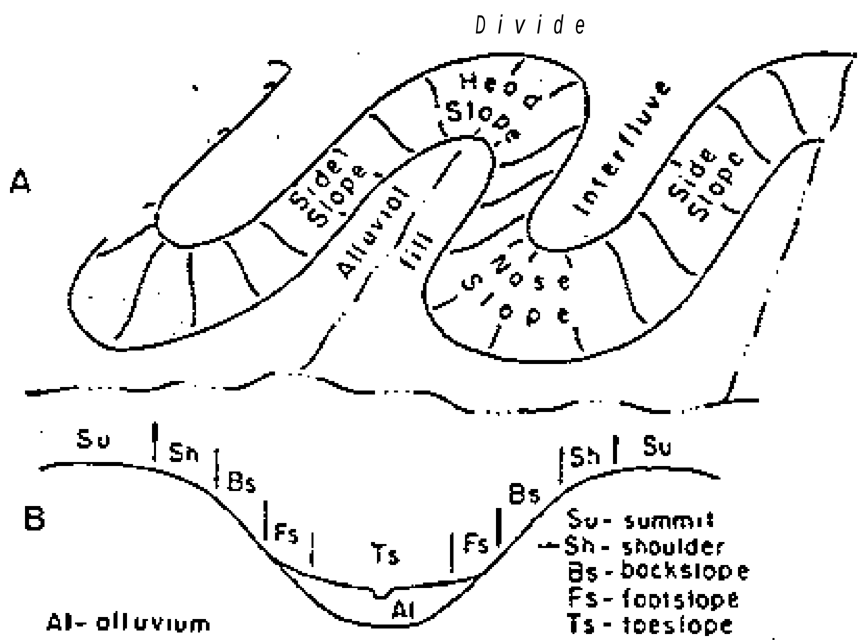

Fig. 1. Geomorphic components of hillslope. (A) Slopes in an open system: Headslope is at the head of the valley, and slope lengths converage downward. Sideslope bounds the valley along the sides, and slope lengths generally are parallel. Noseslope is at the valley end of interfluve and slope lengths diverge downward. (B) On slope profile summit is upland surface and descent downslope successively crosses shoulder, backslope, footslope and toeslope. (Ruhe and Walker, 1968. 9th Int. Cong. Soil Sci. 4:551-560.)

slope shape (Fig. 2).

Russell suggested that there is a need to give more consideration to the landscape components of map units, including more emphasis on map unit design, map unit description, soil correlation of map units, and soil interpretation of map units. He indicated that landscape components (landform, landscape position, length of slope, shape of slope, and natural vegetation, etc.) all have very significant influence on use and management. Most potential users of soil surveys can visualize and otherwise relate to these external components of map units more readily than they can relate to (internal) soil profile characteristics. Soil map units are in reality segments of the landscape; however, this often gets lost in the emphasis on soil profile characteristics and Soil Taxonomy. Most potential users of soil surveys think we map Soil Taxonomy. We don't. We map segments of the landscape, and we should use Soil Taxonomy as a descriptor, not as delineator.

Knox presented a poster presentation at the 1987 SSSA meeting in Altanta. Attached (Fig. 3) is a copy of his poster which does not represent the offical position of Soil Survey staff. He proposes a concept of cartographic series which would represent the full range of similar soils in the landscape unit. These cartographic series would be named and correspond to taxonomic series. Further development and application of this concept would help significantly to elevate the role of landscape characteristics in soil correlation. Better ranges of map unit characteristics could be provided on the interpretational sheets and to the users. This could be done by giving landscape relationships full value in mapping, by giving full range of characteristics in map unit descriptions, and by relating laboratory data to soils as mapped.

Gamble suggested that the primary basis that most people use for analyzing landscapes, describing landscape characteristics, or discussing the components of map units is the configuration of the land surface. He suggests that there are other features that are of equal importance and whose significance is not always fully appreciated. The first consideration is the number and sequence of geomorphic surfaces involved. Geomorphic surfaces are mappable parts of a landscape that differ in age. The probability is high that there are associated soil differences. In the Missouri Ozarks, for example, on a valley slope there can be a sequence of five geomorphic surfaces from the ridgetop to the valley floor and their ages range from pre-Pleistocene to Holocene. There are suites or associations of soils related to these surfaces or combinations of them.

Gamble indicated that a second feature to consider is the internal composition of the landscape unit or landform whose surface form we have described. By this he meant the character and geometry of the various geologic units associated with the geomorphic surfaces and local bedrock. He refers to this as the surficial stratigraphy. Generally it includes the materials overlying the bedrock, but sometimes bedrock is included if the overlying materials are thin. Such things as alluvium, colluvium,

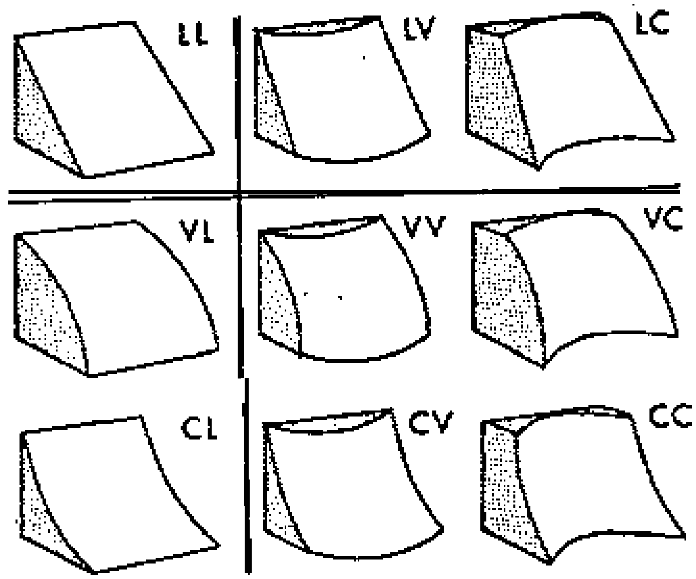

Fig. 2. Hillslope classification based on slope shape. (Slope length is down the form; slope width is across the form. L means linear. V means convex, and C means concave). (Source: Ruhe, 1975; Fig. 6.1 Geomorphic processes and surficial geology. Houghton Mifflin Company, Boston, M.A.)

Soil Series and Map Units
Elds G. Knox
SCS, USDA

Bridges Between Two Worlds
Conventions to Relate Classification and Mapping

Cartographic Series, A New Convention, Could Simplify and Improve Applications of Soil Taxonomy in Soil Survey

Taxonomic World

Definitions
Abstract, Conceptual
Universal fixed criteria
Understanding of genesis and relationships

Background

Series range is limited by differentiating characteristics accumulated from higher categories.

Map unit range in characteristics is determined by objectives and the landscape. Map units consist of:
- one or more major interpretively homogeneous components
  —named soil plus similar soils—
- inclusions of dissimilar soils

To the 1950s, series were adjusted to the landscape.

With adoption of soil taxonomy, series were wrenched free from the landscape and trimmed to fit into families.

Fundamental Problem

Series misrepresent interpretively homogeneous components of map units.
Ranges in characteristics do not correspond.

Problems with Current Conventions

Map unit descriptions are incomplete or awkward.
SOI-5 do not give full range of soil represented.
Laboratory data:
- change classification of many pedons.
- can change map unit names.
- can be discredited or over-emphasized.

Taxonomy influences design and delineation of map units.
Taxonomy can distort selection of pedons for analysis.

Solution

Recognize interpretively homogeneous components of map units as cartographic series.
Give cartographic series full range of similar soils in the landscape.
Name cartographic series for corresponding taxonomic series.

Cartographic World

Observations
Concrete, Geographic
Local landscape relationships
Predictions of characteristics and behavior

Alternatives [redacted]

Use concept to clarify our thinking, or
Change conventions or procedures.

Define range separately for each map unit, or
Define range separately for each survey area, or
Define range uniformly for all areas.

Give full range of characteristics in map unit description.
Give full range of characteristics on SOI-5.
Give landscape relationships full value in mapping.
Relate laboratory data to soils as mapped.
Avoid correlation changes due to taxonomic niceties.

Fig. 3. Source: Knox, E. G. 1987. Soil series and map units. Agronomy Abstracts p.226.

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pedisediment, glacial drift, valley side alluvium, etc., would be included. The thickness, texture, bed shape, gradient, and continuity of these materials exert a strong influence on landscape hydrology and thus affect interpretations. Permeable materials may allow movement of water downslope for considerable distances. Impermeable beds may restrict movement or cause discharge of water in some anomalous location. The shape of a bed may confine water movement to a particular part of the landscape. The external shape of a hillslope may not provide clues as to these important internal features that affect the overall hydrology of a site.

Charee 1. **Discuss landscape** components of map units **(consociations,** complexes, **associations, a**nd undifferentiated) as they relate to making soil interpretations and for geographic information systems. Give priority to effect of landscape components on erosion relationships, crop productivity, and wetland assessment.

Shetron said that the design of soil map units should reflect regional, or local, soil-landform patterns. Most soil scientists involved in soil survey develop soil-landform relationships, especially in glaciated and forested landscapes. Whether a soil **consociation,** complex, or association soil map unit is mapped will depend on the map scale, or order of the soil survey. He suggests the committee review Table 2-l (page 2-14 in the unpublished and revised soil survey manual). Perhaps we should be more concerned with the order of soil survey and composition of the soil map units. In other words, the occurrence of a particular soil **taxonomic** unit (series, family, etc.) within the **landform** instead of just listing percentages of the various soils in a soil map unit (for example, soil A on **3-4%** slopes on knolls and soil B in low wet **0-2% slopes).** Thus concentrate and recommend a specific order of soil survey for interpretations (i.e. technical classification schemes for geological information systems or other interpretations).

Grigal believes that landscape units are the wave of the future. He thinks it is ironic that we are rediscovering them when one of the conceptual foundations of soil genesis/classification has been the catena concept, clearly a landscape unit. It may be that our knowledge has finally matured enough to understand such units, and that our technology has advanced enough so that they can be used in a practical way for land use planning and management. One of the biggest problems that we face in regard to landscape units and development of interpretations thereof, is the preoccupation with vertical concepts of soil genesis, including movement of water, ions, and clays. Instead, we must pay more attention to horizontal movement of all those components. In all but a perfectly level landscape, gravitational forces have both a vertical and a horizontal component, and both components deserve equal attention. As a consequence, soil genesis has both a horizontal and vertical component. That is simply called the catena concept.

Grigal suggested that when we deal with landscape units, the behavior of any unit is strongly affected by the behavior of adjacent units. We must have knowledge of the units that lie upslope, downslope, and laterally. This knowledge is as important es the degree of slope. We must refocus our ideas concerning necessary data; for example, presence of slowly-permeable horizons are important not only for the water regime of a given unit, but are exceedingly important for the regime of the unit downslope that receives subsurface flow off the unit upslope.

Kuehl indicated that the effect of landscape components on erosion relationships and wetland assessment has become more important as we deal with issues related to the 1985 Food Security Act. Interpretation of the criteria for highly erodible soils and hydric soils require an understanding of landscape components, soils, and slopes.

Zavesky suggested that we do describe the landscape position in the map unit description, but not always by defined terminology. In South Dakota, they use a large number of complex map units and each soil component is placed in the landscape. An example would be Clarno-Bonilla loams, 0 to 2 percent; the soils on a very gently undulating glacial plain, which was not mentioned but important to the following positions which were identified. Clarno soils are on slight rises (maybe summits) which grade to the Bonilla soils in swales. He believes most readers could understand this. Also the included soils are located on the landscape. As to landscapes, we probably need a better understanding of landscape positions within a landform. For instance, in this particular unit, the slope length is very short, even on similar units with 2 to 6 percent slopes, and very little sediment from erosion leaves the field due to the swales and depressions which collect runoff and soil sediments.

<u>Erosion relationship.</u> The landscape position would relate where the erosion would occur', such as a shoulder or summit. For wind erosion, much of the initial erosion could start on the summit. (As mentioned above, it is important to know the depositional landscape features (such as swales, toeslopes, and depressions) permit little sediment from water erosion would leave the area).

<u>Crop productivity</u>: Zavesky suggested the crop productivity within a series could vary since the soil could be on the shoulder, backslope or maybe even on the toeslope. The crop yield would be different on each landscape segment.

<u>Wetland Assessment</u>: Zavesky stated that in South Dakota, most of the wetlands are in depressions, but the depressions vary in depth. The configuration of the depression needs to be described. This would help in determining if the wetland is a Type 1. 3 or 4. especially if we know the depth.

<u>Charge 2</u>. Develop guidelines for describing the landscape characteristics of map units at various scales. Include terminology, illustrations and definitions of terms for use in soil map unit descriptions:

Franzmeier suggests we may not want to assume our objective is to improve the landscape description of map units defined in the conventional manner, that is, based on soil series and other taxonomic classes. Instead, it may be helpful to look at the problem from a different perspective. We could consider developing guidelines for describing and mapping the soil landscapes with the primary objective to represent soil landscapes and secondary consideration of soil profiles and taxonomic classes.

Shetron agrees with Franzmeier's point. However, would a map user who has never been exposed to geomorphic terminology be able to understand what is being described, especially the terminology in the attached glossary? If we are to be landform descriptive, then our terminology should be geared to lay people. Otherwise he is afraid we will turn-off the user end be criticized for too technical a soil map unit discussion. A flat, level plain has more meaning than a "lacustrine deposit". Similarly, Ruhes terminology for slopes may also be confusing (i.e., interfluve for the top of a hill that drains into two drainageways or toeslope for base of a hill). We must keep in mind who the user will be and then structure our terminology for interpretative purposes. He is sure that common terminology could be generated.

Most states thought that soil genesis and morphology has been given primary consideration when mapping soils. Many states, including Iowa, also consider landscape position when mapping soils. Kuehl suggests that the best approach might be to try to refine the present soil map units at the 1:15840 scale by looking at the soil profiles but placing more emphasis on soil landscapes. He thought it might be better for broader landscape features to be the primary consideration at the 1:24000 scale.

Zavesky suggests we may need to use the landscape approach when dealing with increased interest in water quality. It would take considerable time to fine-tune a landscape as to slope length, and slope for each segment and area of deposition (concave positions). This would be helpful when using modules.

<u>Charge 3</u>. Discuss the impact of landscape analysis used in models such as the Water Erosion Prediction Project (WEPP). Relate items such es length and shape of slope, erosion, and accumulation or deposition of sediments to WEPP. Can we develop information for map units that will satisfy the needs of WEPP?

Kuehl stated that we can develop more information for map units to use for WEPP. He thought that Area Resource Soil Scientists or Area Resource Conservationists could work on this (in the field) to develop the information or data needed.

Shetron indicated the problem is the distortion, discrepancies and different map scales used needs to be resolved (i.e., changes in soil boundaries by encoding and integrating with MSS, SPOT, USGS topo sheets and soil maps).

Zavesky said it would take considerable time to determine slope length and slope. (We now visually estimate this for HEL planning for FSA). For the erosion models, we would need more precise data which would take more time. Maybe we will have the time after the soil survey. We need to convince the administrators. He is very impressed with the WEPP project in South Dakota, but setting up the project took considerable time. He believes in landscape analysis, but he is concerned with the time requirement.

Charge 4. Illustrate how map units based on landscape might be interpreted for different purposes. This will enable others to better comprehend who the audiences might be and indicate some of the ways in which the information can be used.

Gamble thinks that internal composition of the landscape unit or landform and the sequence of geomorphic surfaces involved are important considerations that should be included in any attempt to design map units and analyze landscapes in order to make interpretations of landscape unit behavior. A proper understanding of geomorphic surfaces, surficial stratigraphy, and landscape hydrology requires more field investigation than we are willing to do at the present. A hierarchy of landscape classification or map units based on external form alone will not be adequate for the interpretations that will be demanded.

Groundwater quality - The movement of water and chemicals through soil has become an important issue. Kuehl suggests that understanding and interpreting soil landscapes will be one of the major needs for information now and in the future. When does water move vertically and when does it move horizontally?

Septic tank leach fields - Design of septic systems is another big issue which needs to be addressed as we look at the movement of water.

Other uses

Kuehl suggested that we could better illustrate map units based on landscapes, by expanding the 3-D block diagrams that we now publish in soil survey reports. These diagrams would relate soils and landscapes to a broad extent. Franzmeier presented a slide set at the committee session which showed examples of block diagrams which could be used in future soil survey publications.

Kuehl indicated that we could do a better job of illustrating the types of slopes. When we talk about headslopes, noseslopes, etc., we need to illustrate those so that our audiences can better comprehend what we are trying to describe in the map units.

Shetron wondered whether a common thread exists for interpretations? Do slight and severe limitations occur within the same soil map unit for a particular use and management? In other words, should we be developing soil map units at the family level instead of series? We generally combine similar series for technical classifications if they have the same use and management. He believes that the soil map units should reflect the "use potential" of that particular soil and landform morphology to absorb one or many disturbances. The common thread is the pedon and its characteristics and how it will behave on a particular segment of a landform.

Grigal believes that landscape map units would be defined as those that behave similarly. By that, he means behave similarly in terms of quantity and/or flux of temperature, water, particulate material, and ions in solution, considering both vertical and horizontal components of that flux. Mapping would yield both vertical and horizontal components of that flux. Mapping would yield a mosaic of such units, similar to those delineated on present soil maps but at a larger scale and therefore in more detail. Presently existing soil map units would usually be subdivided into landscape units; one of the criterion for separation being landscape position. This information would be entered into a geographic information system (GIS). The software and additional data available to the system, such as weather records and topographic information, would serve to link the mapping units into catenas and provide realistic representation of such processes as water movement during storms, soil displacement, nitrate leaching, etc. Such sophistication in developing interpretations would be necessary because a given landscape mapping unit would behave vary differently depending on its size, actual slope (rather than slope class), and the size and slope of the units above and below. The number of possible combinations of such variables are too great to sort out in tables or to test.

Grigal indicated that models are necessary for the representations, or interpretations, that he suggested. By models, he means mechanistic models that include all major pools and processes with which we are concerned. Empirical or black-box models that are based on correlative data are useful. but confidence in predictions for conditions that fall outside their calibration set is low. Confidence in similar extrapolations by mechanistic models that are based on major processes should be much higher. It is impossible to collect data for all possible combinations of landscape units. Soil survey has traditionally made spatial extrapolations. He suggests that we must pursue these newer techniques to achieve both spatial and temporal extrapolation. Many interpretations can be developed. For example, he sees erosion models such as WEPP as being only one of a series of models that require such landscape units to generate realistic predictions. Simulation of hydrologic behavior of landscapes, of fates of herbicides and pesticides, of movement of fertilizers, and a host of many other kinds of behavior could be arrived at by the process he outlined.

Grigal has found from his work, and numerous anecdotal observations, that the growth rate of trees is higher on the lower slope of a given soil mapping unit than it is higher on the slope. The reasons are probably many, and include flushes of nutrients from upslope to downslope and better or more regular water balances downslope. The landscape mapping units that he proposed, and a simple model of tree growth relative to water and nutrients, would result in a better estimate (both more precise and more accurate) of productivity for any land area under study.

Grigal noted in some terrains, data concerning depth to a local or regional water table for some units on specific landscape positions would allow simulation of water table elevation throughout all units on the landscape, and coupled with an evapotranspiration model would allow simulation of water table elevation through time. I could go on and on with ideas, but suffice to say that simulations or interpretations derived from such landscape data would only be limited by the ingenuity of the soil scientists involved in system development.

Franzmeier recommended we develop a new soil survey map product on a topographic base, with map units delineated primarily on the basis of landscape considerations. Any revision of an old soil survey should include landscape information.

RECOMMENDATIONS:

1. Soil survey reports should include additional landscape information (such as position, slope length and slope shape) in soil map unit descriptions, in tables, on maps and in figures.

2. The glossary of landform and geologic terms (NSH - Part II Exhibit 302.7 (a)) should be utilized by soil scientists when mapping and writing soil survey manuscripts.

3. Soil scientists should develop block diagrams which show the relationship between landscape position, soil series and parent material.

4. We recommend the supplementing of existing soil survey report data with landscape information. These supplemental reports could be developed for a soil association map or by major land resource area. Individual states should consider developing such a map product.

5. We suggest any future mapping efforts include increased emphasis on landscape considerations which could improve the interpretational potential of soil surveys. We need to keep improving our map product.

6. We recommend that our Committee 6 (Landscape Analysis) be combined with Committee 2 (Interpretations) since much of the landscape information needed is for various interpretations.

The oral report was presented by chairman Ken Olson. The report was accepted.

RESOLUTION

The North Central Soil Survey Work Planning Conference supports the effort to repopulate Blowout Penstemon into native habitat.

The Blowout Penstemon (Penstemon haydenii) is an endangered species. S.H.A.R.P. (Sandhills Area for Regional Progress) is a nonprofit organization in Stapleton, Nebraska, and is encouraging youth organizations to voluntarily help repopulate native habitat (Blowouts in the Nebraska Sandhills) with potted plants of Blowout Penstemon. S.H.A.R.P. is seeking funding so es to encourage volunteer youth organizations with prizes, awards, prize money. etc.

Contact person: Sue Stickney, H.C. 35. Box 37, Tryon, NE 69167.

Iowa State University of Science and Technology Ames, Iowa 50011

Department of Agronomy
Telephone 515-294-1360

August 2, 1988

Ms.Sue Stickney
H.C. 35. Box 37
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Dear Ms. Stickney:

Enclosed is a resolution passed by the North Central Soil Survey Work Planning Conference. It supports your efforts to repopulate Blowout Penstemon into native habitat.

Good luck on your project. Please let us know if there is anything else that we can do to help your organization.

Sincerely,

Thomas E. Fenton
Professor

TEF/sjc

Record of North Central Soil Survey Conference

Year	Location of Meeting	Chairman
1955	Missouri	Ableiter, Aandahl
1956	Michigan	Westin
1951	Illinois	Bartelli
1958	Wisconsin	Bidwell
1959	Kansas	Rogers
1960	Indiana	Elder
1961	North Dakota	Engberg
1962	Ohio	Riecken
1964	Nebraska	Nelson
1966	Iowa	Ulrich
1968	Minnesota	Mitchell
1970	Illinois	Fehrenbacher
1972	South Dakota	Bannister
1974	Missouri	Scrivner
1976	Michigan	Harner
1978	Wisconsin	Hole
1980	Indiana	Sinclair
1982	North Dakota	Patterson
1984	Kansas	Roth
1986	Ohio	Smeck
1988	Nebraska	Culver
1990	Iowa	Fenton
1992	Minnesota	Heil

SEPTEMBER 1988

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NATIONAL COOPERATIVE SOIL SURVEY

North Central Soil Survey Conference Proceedings

June 16-20, 1986
Columbus, Ohio

North Central Soil Survey Conference
Columbus, Ohio
June 16-20, 1986

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NORTH CENTRAL SOIL SURVEY CONFERENCE
COLUMBUS, OHIO
JUNE 16-20, 1986

Agenda

June 16

10-12 a.m.	Registration	Lobby, Kottman Hall
1:00 p.m.	Opening Comments Neil E. Smeck, Chairman, NCSSC Fred Hutchinson. Vice President for Agriculture, OSU Harry W. Oneth, State Conservationist, SCS Larry Vance, Chief, Division of Soil & Water Conservation Fred Miller. Chairman, Department of Agronomy	Room 103, Kottman Hall
1:50 p.m.	Soil Taxonomy John Witty, SCS, Washington	Room 103, Kottman Hall
3:46 p.m.	Coffee Break	
p.m.	Committee Work Session A	
	Committee 1 Development and Coordination of Soil Survey Data Bases	Room 102, Kottman Hall
	Committee 6 Soil Erosion - Productivity Relationships	Room 104, Kottman Hall

June 17

8:00 a.m.	Committee Work Session 8	
	Committee 2 Soil Interpretations	Room 102, Kottman Hall
	Committee 3 Soil Water Relationships	Room 104, Kottman Hall
9:50 a.m.	Coffee Break	
10:10 a.m.	Committee Work Session C	
	Committee 4 Basic Soil Services	Room 102, Kottman Hall
	Committee 5 Soil Correlation and Classiflcatfon	Room 104, Kottman Hall
12:00 noon	Lunch	
	Afternoon Session Chairman - George Hall Room 103. Kottman Hall	
1:00 p.m.	Geology of Ohio Mike Hanson, Geologist, Ohio Div. of Geological Survey	
1:45 p.m.	Soil Survey - Washington Perspective Tommie J. Holder, Director, Soil Survey Div., SCS, Wash.	
2:15 p.m.	Soil Survey Software Development Team Fred E. Minzenmayer, SCS, Kansas	

June 17, Cont'd

2:50 p.m.	Coffee Break
3:10 p.m.	Cartographic Support of Soil Surveys Lee Sikes, Cartographic Staff, NTC. Fort Worth
3:40 p.m.	Regional Soil Taxonomy Committee Rod Harner, Head, Soil Survey Staff, NTC, Lincoln
4:00 p.m.	Ohio Capability Analysis Program Wayne Channell, Administrator, OCAP, ODNR
6:30 p.m.	Brats on the banks of the Olentangy River

June 18

7:30 a.m.	Field Trip

June 19

8:00 a.m.	Separate Meetings NCR-3 Federal & State Agencies	 Room 102, Kottman Hall Room 104, Kottman Hall
12:00 noon	Lunch	

Afternoon Session Chairman - Keith Huffman
Room 103, Kottman Hall

1:00 p.m.	NC-109 Project Jim Anderson, University of Minnesota
1:20 p.m.	Comments by Representatives of Other Regions
1:40 p.m.	State Report5
3:00 p.m.	Coffee Break
3:20 p.m.	State Reports Continued

June 20

Morning Session Chairman - Bob Ritchie
Room 103. Kottman Hall

8:00 a.m.	Committee Reports Committee 1 - Lou Buller Committee 2 - Gary Lemme Committee 3 - Dave Lewis Committee 4 - Larry Tornes Committee 5 - J. Wiley Scott Committee 6 - Ron Kuehl
11:00 a.m.	Business Meeting and Closing Comments Neil Smeck, Chairman, NCSSC

Anderson, Frank L.
Anderson, James L. MN
Bigham, Jerry
Broderson, Bill
Bruns, Edward L.
Buller, Louie L.
Crum, James
Culver, James R.
Fenton, T.E. IA
Franzmeier, Don IN
Frederick. William E.
Gerber, Tim
Gerken, Jon C.
Haberman, Roger
Hall, George F.
Harner, Rodney F.
Heidt, Cornelius J.
Helzer, Norman P.
Holzhey, Steve
Huffman, K. K.
Jansen, Ivan IL
Johnson, Paul
Kuehl, Ronald J.
Kuzila, Mark S.
Lee, Gerhard B. WI
Lemme, Gary D. SD
Lewis, Dave NE

COMMITTEE ASSIGNMENTS

NORTH CENTRAL SOIL SURVEY CONFERENCE
June 16-20.

Committee V - Soil Correlation and Classification - J.W. Scott, Chairman

Members

Michel Ransom, Vice Chairman
Steve Base
Edward L. Bruns
Terence H. Cooper
William E. Frederick
Roger Haberman
Norman P. Helzer
Mark S. Kuzila
Doug Malo
Alexander Ritchie
Richard Schlepp
Kenneth D. Vogt
Larry D. Zavesky

Committee VI - Soil Erosion - Productivity Relationships - Ronald Kuehl, Chairman

Members

Ken Olson, Vice Chairman
T.E. Fenton
Rodney Harner
Cornelius Heidt
Ivan Jansen
Donald Rex Mapes
Paul E. Minor
Donald D. Patterson
Stephen G. Shetron
H. Raymond Sinclair, Jr.
David L. Smith
Nyle Wollenhaupt

Summary of Committee Charges and Recommendations

(Refer to the detailed committee reports for background and discussion)

Committee 1.--Development and Coordination of Soil Survey Data Bases

Charge I: Provide listings of state and federal data bases containing soil survey information which are available, under development, or anticipated.

Recommendation: Refer to the National Soil Survey Conference with a recommendation that this be a charge for that conference.

Charne 2: Develop a procedure to promote the coordination of concepts and terminology among the various data bases.

Recommendation: No recommendation was made. Considered to be a good idea but implementation would be difficult.

Charge 3: Develop a list of computer programs which have been developed or are under development to aid soil survey activities.

Recommendation: Refer to the National Soil Survey Conference with a recommendation that this be a charge for that conference.

Charge 4: Identify potential users for soil survey data bases.

Recommendation: No recommendation. There was not much response to this charge.

Charge 5: Review the recommendations of the Soil Survey Software Development Team (now identified as Soil Survey Work Group).

Recommendation: The recommendations of the work group were not available to the conference.

Committee 2.--Soil Interpretations

Charge 1: How can the reliability of data placed on SOI-5 files be verified? Should statistical parameters be incorporated so that users will have some way to gauge confidence limits?

&commendations:

1. That statistical parameters not be placed on SOI-5 file records.

2. That NCSS members share data and methods used in developing interpretation ratings with other user groups to improve understanding of SOI-5 information by all users.

Charge 2: Where hard data do not exist, how should estimated soil properties be supported?

Recommendation: Recommend that footnote8 identifying the data source of SOI-5 information not be required. However, SOI-5 authors should be given the option of identifying hard data source8 of those when desired.

Charge 3: Are the procedures for revising data on the SOI-5's satisfactory?

Recommendations:

1. That regional control of the SOI-5 files be continued to insure file uniformity.

2. That all cooperating agencies be provided with copies of updated SOI-5 files as updates occur.

Charge 4: Examine the successes or problems encountered with the soil-crop yield data base program.

Recommendations:

1. That revisions suggested for the SOI-1 form be considered.

2. That the soil-crop yield data base program be continued.

Committee 3.--Soil-Water Relationships

Charge 1: Evaluate the new classes for hydraulic conductivity given in the National Soils Handbook.

Recommendations:

1. If they are not going to be used, remove them from the handbook and replace them with the permeability classes that appear to be more Usable.

2. If they are to eventually be used, develop an organized program to gather data that will support them.

Charge 2: Consider improvement8 in the definition of the moisture control section.

Recommendations:

1. That the moisture control section be evaluated in terms of its usefulness.

2. That it be defined in terms that it can be identified within a given pedon.

Charge 3: Evaluate the desirability of requiring measured or estimated soil moisture data for determining soil moisture regime instead of climatic data.

Recommendations:

1. That this problem be brought to the Soil Taxonomy Committee with suggestion8 that modification in Soil Taxonomy reflect the procedure actually used to classify soil8 where moisture regimes are in question, rather than the presently described criteria that are impossible to test.

2. That climatic models be used to classify soils within these "tension zones."

3. That the parameters of the models used be indicated in the descriptions of taxonomic classes developed by use of these models.

Charge 4: Consider the advisability and utility of the development of regional water information record8 (generalizaton of information available for a given region). Type8 of information which could be considered include; infiltration rates, water desorption curves, water regimes, and runoff.

Recommendation: That the "soil moisture states" be put into use 8s a mechanism to develop regional soil Water information records.

Committee 4.--Basic Soil Service6

Charge A: What services or types of assistance should constitute "basic soil services"? See detailed committee report.

Charge B: Identify the framework (training and/or information) necessary for soil scientists providing basic soil services (state, NTC, and national level). See detailed committee report.

Charge C: Identify research need8 generated by basic soil services. See detailed committee report.

Charge D: How can public benefit of basic soil services be evaluated? How do we show that basic soil service8 are cost-effective? See detailed committee report.

Charge E: How can basic soil services be coordinated among the SCS, the state experiment stations, the cooperative extension service, and other NCSS cooperators? See detailed committee report.

Recommendations: The committee strongly recommends the continuation of the basic soil services committee. No firm Charges are recommended by the committee at this time. However, two possible charges for the future could be:

1. Evaluate the effectiveness of professionals providing basic **soil** services.

2. What basic soil services can be provided by public soil scientists and consultants?

Committee **5.--Soil** Correlation and Classification

__Charge 1__: Develop criteria that will clearly distinguish C and Cr horizons.

__**Recommendations**__:

1. That emphasis be placed on the key phrase common to both the definitions of Cr and Cd, that "roots cannot enter except along fracture planes."

2. That additional clarification and guidelines be provided by a national committee for the applications of Cr and Cd in soil descriptions. There are at least three examples that were discussed that need clarification:

a. The intended meaning of the term unconsolidated because some people consider dense till to be consolidated, while others believe the term should only be applied to bedrock.

b. Whether numerical parameters are needed for percentage of rock material __vs__ **soil** material, especially in the gradational zone of weathered bedrock where rock fragments are still oriented in bedding planes similar to the bedrock.

c. The proper designation **of** the weathered layer at the upper surface of hard bedrock that **is** fractured and weathered but has discrete fragments of hard rocks with soil material between them or filling the cracks.

__**Charge 2**__**:** To examine the suitability of the current range of characteristics for official soil series and, if needed, develop guidelines that will establish suitable ranges for properties of series.

The following subtopics were identified as items of discussion.

1. Transitional horizons. See detailed committee report for discussion.

2. Thickness range for an E horizon: This is one of the master horizons, and not a transitional horizon.

__**Recommendation**__**:** That the pedon be classified in a taxonomlc class that best defines the soil forming process under which it formed. Therefore we should state a range of thickness that we should expect to see in an undisturbed pedon. The thickness requirement should be waived for pedons that are eroded or deeply plowed so that the E horizon is absent. This allows us to classify pedons outside the stated range if we can account for the absence of the layer. It also guards against placing other soils that, because they developed under different soil forming processes, never had an eluvial horizon.

3. Series control secton vs taxonomic control section: This discussion centered on soils that have a modem solum formed in two parent materials across a lithologic discontinuity.

Recommendation: That this item be referred to the regional Soil Taxonomy committee for consideration. We discussed a proposal to change the wording in Soil Taxonomy to delete the reference to diagnostic horizons and substitute the term "pedogenically altered" horizons. John Witty suggested that a better solution would be to change the wording to clarify the intent that for pedons that have a solum thickness between one and two meters, that the series control section include the entire solum.

4. Geographic distribution of soil series: The concern was that some series are being used so widely over changes in temperature or moisture regimes that the interpretations are not valid.

Recommendation: That this question be referred for further discussions and clarification. Either this charge be held over for continuation by this committee, referred to the Rational Conference, or referred to the principal soil correlator to clarify the guidelines of choosing between a phase or a new series.

5. Better definition of the 0 horizons (leaf litter) on mineral soils. See detailed committee report for discussion.

6. Salinity and other properties as they relate to soil behavior and the interpretations assigned. See detailed committee report for discussion.

7. Use of eroded pedon for series concept. See detailed committee report for discussion. During the committee oral reports some conference members suggested that this subject be continued or referred to another committee for further consideration.

Committee 6.--Soil Erosion-Productivity Relationships

Charge 1: Identify and priortize soil properties affected by erosion and evaluate their relative impact on productivity.

Recommendation: An attempt should be made to evaluate charge 1 at the family level of Soil Taxonomy. This committee should share this report and discussion with the NC-174 committee on Soil Erosion-Productivity. Ken Olson is chairman of both committees.

Charge 2: Determine the data presently available or needed to support the estimated impact of soil erosion on productivity.

Recommendation: The committee feels that this committee lacks the resources to study or review the data available in the detail needed. We recommend that this charge be dropped from the charges of this committee for the 1988 Soil Survey Conference.

Charge 3: Consider procedures for validation of the output generated by models presently available such as EPIC.

Recommendation: The committee recommends coordination of activities vith the regional NC-174 committee. This will start with a report on this discussion. Ken Olson, who has an appointment on both committees, will provide this exchange. Due to the time and funds required to build a data base, the regional NC-174 committee should be better able to recommend "procedures" for validation or development of a data base.

Charge 4: Evaluate the suitability of the present erosion classes with particular attention to map units. Consider the development of guidelines for clearly distinguishing erosion classes in map unit descriptions.

Recommendation: The suggestion was made by Tom Fenton that each state list the criteria they use for defining eroded phases. He also questioned how other states handle E horizons. In other words, is the E horizon treated as part of the surface layer or subsoil? The committee agreed that a survey should be taken of each state concerning the guidelines used in identifying and mapping the slightly, moderately, and severely eroded phases. Rod Harner said that the NTC will handle the distribution of this survey.

Charge 5: To determine the need for improvements of the Universal Soil Loss and Wind Erosion Equations.

Recommendation: Whatever changes or improvements are made in the equations, the committee stresses the importance of using the equations for the use they were intended. The committee proposes that this charge be dropped from the charges of this committee for the 1988 Soil Survey Conference.

Final Recommendations: Soil Erosion-Productivity Relationships Committee agreed that its work is not finished and recommends that the committee be continued. The committee recommends that emphasis be placed on guidelines for distinguishing erosion phases. The following charge is recommended for the 1988 Soil Survey Conference:

Evaluate the suitability of the present erosion phases. Develop guidelines for clearing distinguishing erosion phases in map unit descriptions, We also recommend a continuation of charge 3 for the 1988 Soil Survey Conference and that all future activities of this committee be coordinated with those **of NC-174.**

North Central Soil Survey Conference
Columbus, Ohio
June 16-20, 1986

Minutes of the General Session and Business Meeting

The 1986 Biennial Meeting of the North Central Soil Survey Conference was called to order by Chairman Neil Smeck at 1:00 p.m. June 16. The conference members were given a warm welcome and cordially supported by Dr. Fred Hutchinson. Vice President of Agriculture, Ohio State University, Wes Oneth, State Conservationist, Soil Conservation Service, USDA, Larry Vance, Chief, Ohio Division of Soil and Water Conservation and Dr. Fred Miller, Chairman, Department of Agronomy, Ohio State University.

Conittee work sessions were conducted Monday afternoon and Tuesday morning. Reports of individuals making presentations are noted on the agenda and a summary of their presentations is included in the conference proceedings. A well planned, interesting field trip provided the activity for Wednesday. Thursday morning NCR-3 and federal meetings were held.

Thursday afternoon each state presented a report of current research or related activity pertaining to their state. This is the first time each state has had a formal opportunity to share information and exchange ideas with each other at this conference. This method of sharing current soil survey activities between states was well received by SCS and University personnel. Reports of each state are identified in the table of contents.

The following is a brief discussion of each committee report as presented Friday morning by the chairman:

Committee I - Development and Coordination of Soil Survey Data Bases - Louie Buller

Conference recommended programs listed under charges 1 and 3 be provided to all members of the conference for their use. Committee recommended charges 1 and 3 be combined. There was no activity on charge 5 since the Soil Survey Software Development Team is still in the process of developing recommendations. Committee report accepted and recommended for continuation on move by Bill Roth and second by Gary Lemme. Motion carried.

Committee II - Soil Interpretations - Gary Lemme

Discussion on charge 4 centered on use of SCS-SOI-001 Soil-Crop Yield Data form for collection of crop yield data. Rod Warner suggested the committee chairman provide the MNTC a list of items which need to be added, deleted, or revised on the SCS-SOI-001. Dave Lewis moved and Steve Payne seconded approval of report and continuation of Cormnittee 2. Motion carried, Committee III - Soil-Water Relationships - Dave Lewis

Recommended the committee charges for the 1988 conference be coordinated with activity of NC-109 committee. Good discussion on a number of items. Ken Olson questioned use of soil moisture to identify the Udic soil moisture line. Ed Bruns stated that carbonates were not effective in relation to soil moisture lines for all soils and should be deleted as criteria. Neil Smeck noted it is very difficult to relate to present criteria in soil moisture control section. Don Franzmeier raised the question on why the Thornthwaite model was not used in the definition used in soil taxonomy. Tom Fenton moved and Don Franzmeier seconded approval of report and continuation of Committee 3. Motion carried.

Committee IV - Basic Soil Services - Larry Tornes

Two assumptions exercised by the committee were (1) Most basic soil services would be provided in areas where soil survey was completed and (2) basic soil services are not limited to SCS soil scientists.

Dave Lewis inquired about the availability of any information on monies saved as a result of using completed soil surveys. Neil Smeck noted we need to identify what additional training and communication is needed by soil scientists performing basic soil services. Ray Sinclair indicated some soil scientists preferred field mapping over basic soil services. The working atmosphere of performing basic soil services is much less structured.

Don Franzmeier suggested good coordination is needed for accomplishment of basic soil services; Dave Lewis commented supervisors need to have adequate criteria to reward high producing soil scientists in basic soil services while Steve Payne indicated soil scientists need to collectively work with area conservationists in accomplishment of goals. Motion committee report by Norm Helzer and seconded by Randy Miles. Motion carried.

Committee V - Soil Correlation and Classification - J. Wiley Scott (report presented by Michael Ransom, Vice Chairman)

Group discussion centered on concept of naming severely eroded and eroded soils which have mollic epipedon prior to erosion. The discussion on eroded series versus new series is well sunarized in committee report. Motion by Dave Lewis to accept committee report and recommended continuation of committee; seconded by Ed Bruns.

Comnittee VI - Soil Erosion - Productivity Relationships - Ron Kuehl

Discussion on K values for forest land, as compared to cropland and the field criteria used by various states for defining eroded phases, was highlighted. Recommended charges 2 and 4 be dropped for the 1988 Soil Survey Conference. Charge 3 is recommended to be coordinated with activities of regional NC-174 committee. Motion by Tom Fenton to accept committee report and recommended for continuation; seconded by Ray Sinclair. Motion carried.

Business meeting was chaired by Neil Smeck Friday morning following committee reports. Dave Lewis made a motion that the minutes of the 1984 North Central Soil Survey Conference held at Manhattan, Kansas be approved. Motion seconded by Tom Fenton. The minutes were approved as written by Neil Smeck. Secretary.

The purpose, policies, and procedures of the North Central Soil Survey Conference of the National Cooperative Soil Survey were revised by Rod Harner and copies were provided to conference participants at the beginning of the Monday session. Rod Harner moved this revision with minor discussed modifications be accepted and was seconded by Keith Huffman. Motion carried.

Jim Anderson discussed NC-109 committee work and need for project revision in 1987. Rod Harner made a motion that a letter be sent to the administrative advisor of the NC-109 committee expressing support for the project by the North Central Soil Survey Conference. Keith Huffman seconded the motion.

Members of the conference wish to express their appreciation for the excellent manner in which George Hall, Nail Smeck and Keith Huffman provided leadership for making local arrangements. The assistance of the Agronomy Club and graduate students for the social activity on the banks of the Olentangy River and the numerous individuals

Jim [illegible]

MINUTES
NCR-3 MEETING
KOTTMAN HALL. THE OHIO STATE UNIVERSITY
COLUMBUS, OHIO

JUNE 19, 1986

THE 1986 MEETING WAS CALLED TO ORDER AT 8:05 A M. BY CHAIRMAN PATTERSON MEMBERS, ADVISOR, AND FRIENDS OF NCR-3 PRESENT WERE:

ILLINOIS	IVAN JANSEN*, KENNETH OLSON
INDIANA	DONALD FRANZMEIER*
IOWA	THOMAS FENTON'
KANSAS	MICHEL RANSOM*
MICHIGAN	DELBERT MOKMA*, STEPHEN SHETREN, JAMES CRUM
MINNESOTA	JAMES ANDERSON
MISSOURI	RANDY MILES*, SAMUEL ORR
NEBRASKA	DAVID LEWIS', MARK KUZILA
NORTH DAKOTA	DONALD PATTERSON*
OHIO	NE IL SMECK*, GEORGE HALL
SOUTH DAKOTA	GARY LEMME*
WISCONSIN	GERHARD LEE*
ADMINISTRATIVE ADVISOR	STEPHEN SMITH

● DFfICIAL REPRESENTATIVE TO NCR-3

CHAIRMAN PATTERSON SUGGESTED SEVERAL ITEMS TO BE CONSIDERED DURING THE MEETING. ONE Of THE ITEMS CONCERNED A REOUEST FROM THE UNIVERSITY REPRESENTATIVES OF THE SOUTHERN SOIL SURVEY CONFERENCE FOR THE OTHER REGIONS TO ADOPT A RESOLUTION SIMILAR TO THE FOLLOWING : ● ADOPT SSIR# 1 AND UPDATES AS THE OFFICIAL METHODSAND PROCEDURES FOR THE CHARACTERIZATION Of SOILS IN THE SOUTHERN REGION WITH THE EXCEPTION Of SOIL MINERALOGY". THE SOUTHERN REPRESENTATIVES REOUESTED THAT THE OTHER REGIONS ADOPT SIMILAR RESOLUTIONS THIS YEAR AND THEN CONSIDER A NATIONAL AGREEMENT AT THE NATIONAL MEETINGS NEXT YEAR. THEY WOULD ALSO LIKE TO PROCEED WITH THE EFFORT OF REGISTERING THE METHODS WITH THE ASTM.

HE ALSO REQUESTED THAT THE STATE REPORT BE SHORT AND THAT AN UPDATE OF THE STATUS REPORT FOR EACH STATE BE GIVEN TO SECRETARY FENTON TO BE INCLUDED WITH THE MINUTES. CHAIRMAN PATTERSON REPORTED THAT THE NCR-3 COMMITEE WAS AUTHORIZED TO CONTINUE TO SEPTEMBER 30.1989. HE DISCUSSED THE LETTERS HE HAD WRITTEN CONCERNING THE PROPOSED CONSOLIDATION OF THE REGIONAL TECHNICAL CENTERS OF SCS. TWO CONGRESSIONAL COMMITTEES WERE CONTACTED. HE RECEIVED RESPONSES FROM EACH OF THE COMMITEES. ONE COMMITTEE CHAIR RESPONDED THAT THE USDA COULD DO WHAT THEY WANTED.

CHAIRMAN PATTERSON REVIEWED THE MINUTES OF THE LAST MEETING AND THEY WERE APPROVED AS CIRCULATED.

IT WAS AGREED THAT CHAIRMAN PATTERSON WOULD REOUEST THAT A DISCUSSION OF SCALE OF FIELD SHEETS BE ADDED TO THE AFTERNOON AGENDA SO THAT SCS COULD INFORM US OF CURRENT OPERATING PROCEDURES IN THIS AREA. FRANZMEIER ASKED WHO IT WAS THAT MAKES THE DECISION ON HOW MUCH IS SPENT ON PUBLICATION OF SOIL SURVEYS. NO ONE

KNEW THE ANSWER SO DON PATTERSON AGREED TO ASK MR. HARNER

THE RESOLUTION PROPOSED BY THE SOUTHERN REGION WAS DISCUSSED IN DETAIL COMMENTS INCLUDED THE FOLLOWING: WHAT ARE THE ADVANTAGES OF REGISTRATION OF METHODS WITH ASTM? IT TAKES A LONG TIME TO GET APPROVAL BY ASTM IT COSTS $50 PER YEAR TO BE A VOTING MEMBER OF ASTM. WE ALTER THE PROCEDURES TO MEET OUR NEEDS AND ADAPT TO THE EQUIPMENT THAT WE HAVE. WHICH OF THE METHODS IN SSIR# 1 AND UPDATES ARE PRESENTLY RECOGNIZED

CENTRAL BY-LAWS SUGGEST THAT THE CHARIMAN OF THE PREVIOUS REGIONAL CONFERENCE SHOULD BE ON THE STEERING COMMITTEE FOR THE NATIONAL CONFERENCE, EXTENSION SHOULD BE REPRESENTED AT THE NATIONAL CONFERENCE AND SOMEONE FROM THE NEXT HOST STATE SHOULD ATTEND THE NATIONAL CONFERENCE. THE NCR-3 GROUP ACCEPTED THESE RECOMMENDATIONS, AT THE 1987 NATIONAL WORK PLANNING CONFERENCE OUR REPRESENTATIVES WILL BE: NEIL SMECK, STEERING COMMITTEE; DAVE LEWIS REPRESENTATIVE; JIM ANDERSON, EXTENSION REPRESENTATIVE.

THE REGIONAL SOIL MAP WAS DISCUSSED. FENTON WILL SEND OUT GUIDELINES FOR THE LEGEND AND ANY REVISIONS OF THE MAP AND LEGEND SHOULD BE MADE AND FORWARDED TO FENTON BEFORE SEPTEMBER 15, 1986.

DAVE LEWIS DISTRIBUTED COPIES OF THE PROPOSED NC-109 PROJECT REVISION. THE REVISED PROJECT IS TITLED "RELATING SOIL WETNESS TO SELECTED SOIL AND LANDSCAPE FEATURES TO LAND

STATUS REPORT ON SOIL SURVEY IN THE NORTH **CENTRAL** REGION

June 1986

State	Counties or Survey Areas: Total	Published	In Press	In Progress	Waiting[1]	Field Soil Survey scientists: Federal: SCS	Federal: Non-SCS	State and Local	Estimated Completion Date	Date of Oldest Survey
IL	102	51	21	25	15	37	0	33	1991	1960
IN	92	67	21	4	0	13(1)[2]	0	5	1987	1960
KS IA	105 99	69 91	9 8	18 6	0 3	44(21)[2] 17	0 0	0 0	1988	1960 1959
MI MN	83 a7	42 43	12 8	10 18	23 14	26 33	7 2	27 9	1997 1996	1960 1960
MO	114	49	13	22	30	29	3	30	1995	1953
NE	93	70	10	12	1	18	0	10	1989	1954
ND	53	24	6	10	12	26	0	0[3]	2000	1964
OH	88	61	13	13	1	20	0	16	1991	1958
SD	68	46	9	10	1	23	0	0	1992	1959
WI	72	48	4	7½	23½	26	3	2	≈2000	1955

[1] Includes scheduled initial surveys and planned updates of entire counties or areas.

[2] Number of SCS field soil scientists (or FTEs) whose salary is granted to SCS from state and local funds.

[3] Contract mapping by the State Soil Conservation Committee on appropriated funds ranges from 250,000-325,000 acres per year,

MEMBERSHIP

North Central Regional Committee NCR-3 - Soil Survey
June 1986

ILLINOIS	Ivan J. Jansen Dept. of Agronomy 1102 S. Goodwin Univ. of Illinois Urbana. IL 61801 (217) 333-3651
INDIANA	Donald P. Franzmeier Dept. of Agronomy Purdue University West Lafayette, IN 47907 (317) 494-8065
IOWA	Thomas E. Fenton Dept. of Agronomy Iowa State University Ames, IA 50011 (515) 294-2414
KANSAS	Michel D. Ransom Dept. of Agronomy Kansas State University Manhattan, KS 66506 (913) 532-7203
MICHIGAN	Delbert L. Mokma Dept. of Crop 6 Soil Sci. Michigan State Univ. East Lansing, HI 48824 (517) 353-9010
MINNESOTA	Richard H. Rust Dept. of Soil Science Univ. of Minnesota St. Paul, MN 55108 (612) 376-9183
MISSOURI	Randy J. Miles Dept. of Agronomy Univ. of Missouri Columbia. MO 65201 (314) 882-6606
NEBRASKA	David T. Lewis Dept. of Agronomy Univ. of Nebraska Lincoln, NE 68583 (402) 472-1570
NORTH DAKOTA	
OHIO	
SOUTH DAKOTA	
WISCONSIN	

Meetings and Officers of NCR-3

Date	Place of Meeting	Chairman	Secretary
1934	?	(committee just organized)	
June 1949	Urbana, Illinois	H.H. Krusekopf	--
? 1950	?	F.F. Riecken	--
June 1951	Brookings, S.D.	F.F. Riecken	E.P. Whiteside
June 1952	Columbia. Missouri	E.P. Whiteside	F.C. Westin
May 1953	Wooster. Ohio	E.P. Whiteside	F.C. Westin
Feb. 1954	Madison, Wisconsin	F.C. Westin	N. Holowaychuk
June 1954	Lincoln, Nebraska	F.C. Westin	N. Holowaychuk
Nov. 1954	Chicago, Illinois	N. Holowaychuk	R.T. Ode11
Jan. 1955	Columbia, Missouri	N. Holowaychuk	R.T. Ode11
Jan. 1956	East Lansing, Michigan	R.T. Odell'	F.D. Hole
June 1956	Ames, Iowa	N. Holowaychuk	R.T. Ode11
Jan. 1957	Monticello. Illinois	R.T. Ode11	F.D. Hole
June 1957	No meeting held	F.D. Hole	H.P. Ulrich
Jan. 1958	Madison, Wisconsin	F.D. Hole	H.P. Ulrich
June 1958	No meeting held	H.P. Ulrich	H.F. Arneman
Jan. 1959	Manhattan, Kansas	H.P. Ulrich	H.F. Arneman
Jan. 1960	Lafayette, Indiana	H.P. Arneman	O.W. Bidwell
Jan. 1961	Fargo, North Dakota	O.W. Bidwell	H.W. Omodt
March 1962	Columbus, Ohio	H.W. Omodt	J.A. Elder
Dec. 1962	Minneapolis, Minnesota	J.A. Elder	C.L. Scrivner
June 1963	East Lansing, Michigan	C.L. Scrivner	F.C. Westin
Jan. 1964	Lincoln, Nebraska	C.L. Scrivner	F.C. Westin
Jan. 1965	Chicago, Illinois	F.C. Westin	F.F. Riecken
March 1966	Ames, Iowa	F.F. Riecken	G.A. Johnsgard

Date	Place of Meeting	Chairman	Secretary
Jan. 9-10, 1967	O'Hare Inn. Des Plaines, IL	G.A. Johnsgard	E.P. Whiteside
Mar. 18-19, 1968	St. Paul, Minnesota	E.P. Whiteside	N. Holowaychuk
Mar. 17-18, 1969	Chicago, IL	N. Holowaychuk	F.D. Hole
Mar. 2, 1970	Champaign, IL	F.D. Hole	R.H. Rust F.C. Westin, Acting
Apr. 22-23, 1971	Ramada Inn, Schiller Park, IL	R.H. Rust	O.W. Bidwell
Apr. 18. 1972	Rapid City, South Dakota	O.W. Bidwell	D.P. Franzmeier
Nov. 28, 1973	U. of Wisc., Madison. WI	D.P. Franzmeier	H.W. Omodt
Apr. 9, 1974	Osage Beach, MO	H.W. Omodt	T.E. Fenton
Nov. 18-19.1975	Holiday Inn, Schiller Park, IL	T.E. Fenton	J.B. Fehrenbacher
May 6. 1976	Traverse City. MI	J.B. Fehrenbacher	F.C. Westin D. Malo, Acting
Oct. 25, 1977	St. Louis, MO	F.C. Westin	N.E. Smeck
Feb. 2, 1978	Madison, WI	N.E. Smeck	G.B. Lee
Oct. 17, 1979	Holiday Inn NE, Lincoln, NB	G.B. Lee	D.L. Mokma
May 21. 1980	Ramada Inn. Lafayette, IN	.D.L. Mokma	D.T. Lewis
Nov. 11. 1981	Rodeway Inn. St. Louis. HO	D.T. Lewis	R.H. Rust
May 5. 1982	Holiday Inn. Fargo, ND	R.H. Rust	O.W. Bidwell D.D. Patterson, Acting
Nov. 2-3, 1983	Ramada Inn, Omaha, NB	O.W. Bidwell	I.J. Jansen
Apr. 4. 1984	Ramada Inn, Manhattan, KS	I.J. Jansen	D.P. Franzmeier
Oct. 30-31, 1985	U. of Minnesota, St. Paul, MN	D.P. Franzmeier	D.D. Patterson
June 19. 1986	Ohio State U., Columbus, OH	D.D. Patterson	T.E. Fenton

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Session for Federal and State Agencies
NORTH CENTRAL SOIL SURVEY CONFERENCE
June 19, 1986
Rodney Harner, Chairman

Representatives of federal and state agencies met from 8:00 to noon. The following is a summary of the items covered in the session.

General Comments
Rod Harner

Of the approximately 2590 series that the Midwest States have responsibility for all but 172 have been entered into the Official Series Description (OSED) file. A handout listed the series that each state does not have in the file. There is a need to get all series descriptions into the file so that everyone has access to the latest descriptions. States ehould update the horizon designations if needed and key the descriptions. If a description is in need of updating, a *statement can* be put in the remarks.

Revisions on the SCS-SOI-5 form that were proposed by Midwest State8 were submitted to NHQ in May 1986. The schedule is for a revised SOI-5 form to be finalized by October 1, 1986, and revisions programmed in January 1987.

Revisions on SCS-SOI-1 (crop yield) form that were proposed by Midwest States were submitted to NHQ in December 1985. The schedule is for the form to be revised by October 1, 1986; obtain USDA agency concurrence of revisions by December 1, 1986; reprogram data base, develop standard output, write and issue guide by May 1987.

In March 1986 the status of editing soil survey manuscripts in the MNTC was a8 follows:

Surveys edited to date in FY86	21 (includes 1 in NENTC)
Surveys in edit	+10 (includes 3 in NENTC)
Surveys on hand ready for edit	+19
Surveys to be received for edit in rest of FY86	+32
Total surveys available for editing in FY86	82
Projected total surveys edited in FY86	-37
Carryover to FY87	45
Surveys to be received for edit in FY87	+43
Total surveys available for editing in FY87	88
Projected total surveys edited in FY87	-33 (MNTC only)
Carryover to FY88	55

The present rate of editing is in line with map negative preparation and funds available for publication.

States need to be sure that the 10 percent sample of soil maps that is sent to NCC for review is representative of the job. This is the only quality control outside of the state.

Some series descriptions are not being circulated as they should be. The National Soils Handbook gives the following guidelines on page 602-36(vi); "copies are sent to adjoining states and to any other states in which the series or competing series are known or expected." It is not necessary to send drafts of series to states that cannot use that classification (i.e., frigid series to Nebraska, Typic Ustolls to Iowa). **Series drafts need to be** sent to user states, states that have responsibility for competing series, and states within the possible area of use. 1

At the state soil scientists workshop in October 1985, states interested in 8 training course on soil survey management were asked to contact Sy Ekart regarding need and content. No interest has been expressed to date.

Computer Files

Louie L. Buller

I. The OSED file and the SOI-5 file

1. The update procedures for the OSBD file and the SOI-5 file will be modified so that at the **beginning of every** month each state will get a list of series or SOI-5 forms they use which have been updated that month. We will discontinue our series description courtesy **copy** when this becomes operational. Eventually, instead of getting a list of series descriptions and SOI-5 forms, the series descriptions and the SOI-5 forms will be sent directly to the State Soil Survey Data Base (3SD) in each state.

2. The state office FOCAS will most likely become the source for series descriptions and SOI-5 forms for cooperating agencies in the state.

II. Updating MUUF for 3SD

1. MIDWEST BTC BULLETIN NO. 430-6-2 outlines the preferred procedure for updating the MUUF for 3SD. The first group of ***survey areas or counties to go into*** each state's 3SD will be on a tape from Ames. In order to accomplish this, we need a list **of the survey areas** with clean sets of SOI-6 forms in MUUF by September 1, 1986. Your **first priorities for naming** the survey areas are those areas needed ***for*** **CAMPS** and **the** second priority is recently correlated survey areas. Correlations from the past 3 years should be in fairly good shape.

III. Classification file

1. The classification file is being moved to Ames, Iowa, and should be operational by October 1. It will be on a data base and will be flexible

as to the type of printouts. The flexibility will be similar to the national soil survey area data base or the soil survey schedule data base. There will also be some standard printouts.

IV. Other items

1. Ken Hinkley is seriously considering taking CO-02 budget money out at the national level and buying a personal computer for each ongoing survey with more than 1 year to go. These personal computers would be similar to the computers being purchased for the field offices except they would only have the MS/DOS operating system.

2. Plans are underway to reformat the OSED file. The reformatting would affect data entry, storage, and retrieval. This change would most likely include a new series description format.

NATIONAL SOIL SURVEY LABORATORY SERVICES

C. Steven Holzhey

NSSL LIAISON ARRANGEMENTS

Maurice Mausbach, former NSSL Liaison to the Midwest, has not yet been replaced. Ronald Yeck has been serving in an acting role since October 1985. There is not a firm date to fill the vacant position.

We have proposed to spread this duty among a larger number of NSSL soil scientists. The proposal assigns three people 'instead of one to the North-Central Region. One or more would also serve some states from an adjacent region. We are soliciting suggestions at the Regional Soil Survey Conferences, and would appreciate any suggestions at any time for enhancement of the liaison functions. An announcement about new arrangements will come out in July.

COMPUTER ACCESS TO LABORATORY DATA BASE

The NSSL data base recently became accessible from remote terminals through a new INTERACT program, resident at the Nebraska Statehouse Computer Center in Lincoln. This is the same center that houses AGNET. Benny Brasher of NSSL led in development of the data base and the interactive program.

The INTERACT program allows access to the data collected since 1978. States will be able to check on status of current projects as well as accessing completed data. Pedon descriptions sre being entered as resource* permit. Older data will be sdded when quality control checks and other screening is completed.

The placement of pedons needs to be updated as rapidly as time permits, through the SCS-SOI-8. NSSL facsimiles of these forms were mailed to each state for review in 1984. These should be returned through the MNTC Soils Staff with concurrence or changes in the information carried on the facsimiles. The whole data base is being copied by other agencies with the warning from us that classification is not final on the majority of pedons.

A printout of the **pedons** from each state was sent to respective states along with the computer access numbers. **As** INTERACT is used, we would like to know what other kinds of hard copy information would be useful.

Downloading to AT&T and other computers will be possible.

STATUS OF LABORATORY SERVICES

The analytical backlog of samples on hand is larger than normal. The analytical staff has five vacancies (four through retirement), which will translate into either several new faces or to continued large **backlog.**

Larry Brown will replace Robert Jordan as head to the characterization laboratory and Fred **Kaisaki** will head the soil chemistry section in place of Dean **McMurtry. Dewayne** Hays will assist Larry Brown.

Robert Jordan was the last person in NSSL to have started with the **BPI** soil survey.

The following are some figures about the workload, as of June 4, 1986.

	<----Pedons----->				<----Samples---->				
	CP	RP	RT	**TOT**	CP	**RP**	RT	QS	TOT
Midwest	45	187	27	259	198	1176	182	242	1798
Total	236	278	69	583	1535	1555	399	836	4325

Legend: CP = characterization, **RP =** reference project large enough for permanent data retention, RT = reference project, temporary data retention, and QS = quick **analysis,** no records retained.

This is the lowest number of characterization samples from the **Midwest** in recent years, and less than the number received **from any of** the other four NTC areas during the first 3 quarters of this year. The Midwest continues to lead all areas in the number of reference samples.

There is no target ratio between characterization and ***reference projects.*** It is recommended that costs be computed when work is planned. Sometimes a little more work in the laboratory makes data much more useful. Sometimes a little less is adequate. **NSSL** will send information on analytical costs to aid in assessing the impact a request may have on the laboratory.

The NSSL can now analyze for B, Se, Cd, Pb and a number **of** other minor elements on a limited basis. At present these are not done as part of the standard characterization, but can be done on a selective basis.

Otto Baumer of NSSL has developed a mathematical model and computer programs to compute soil water retention curves from standard NCSS data. He is working with drainage and irrigation engineers to install the programs on AT&T equipment. Sampling in the Midwest and analyses at NSSL to teat the model are now completed. Otto and John Rice, drainage engineer at the MNTC, will be working with state **offices** to install the microcomputer programs. Otto's program will provide input to drive the **DRAINMOD** model for drainage system design. The same water retention curves can be provided **from** the **NSSL** data base for other purposes as needs arise.

State General Soil Map Geographic Data Base (STATSGO)

Roger **Haberman**

Roger reviewed portions of National Instruction No. 430-302 dated November 14, 1984, and the summary **of** items discussed at meetings in the West Region and Tennessee Valley Authority Area. The summary **of** items discussed at other meetings vas sent to each state by the **MNTC** vith a cover letter dated April 16. 1986.

Each state gave a short progress report on the **STATSGO** project.

Recorrelation of Published Soil Surveys

Rod **Hamer**

The procedure for recorrelation **of** published soil surveys **was** discussed. This procedure vas transmitted by **Midwest** NTC Bulletin NO. 430-6-1, March 10, 1986. Becorrelation needs to be documented **when** the Map Unit Use File **(MUUF)** is prepared for use as part of the **soil** survey data base **(3SD).** There vere **tvo** handouts. One **was** II list of **variants** that have been correlated by state and survey area. The other list shoved the map units in the **MUUF** for which the soil interpretation record number does not agree with the soil named in the map unit,

Positions for Soil Scientists

Ron Kuehl

Ron discussed his effort to obtain information about positions available for soil scientists within the SCS throughout the country. This information was made available to the soil scientists in **Iowa.** Ron reported that it improved morale and increased production **of** soil scientists within the state.

SOIL SURVEY - WASHINGTON PERSPECTIVE

Tommie J. Holder
(Presented by Rod Harner)

The Soil Survey Division, National Headquarters, SCS, outlook on the continued operation of the National Cooperative Soil Survey in FY-1986-90.

In PY-1986 operating with $54,338,000. At the end of May, SCS had 1,198 soil scientists: 1,136 in states; 28 in NTC's; 15 at the NSSL; and 19 in NHQ. This reflects a net decrease of 58 (including 18 GS-11's and 38 GS-9's) since May 1, 1985.

Best guess on CO-02 appropriations in PY-1987 is about $55,360,000; which may or may not be impacted by sequestration per implementation of "Gramm-Rudman" legislation.

Major effort underway to obtain additional funds via supplemental appropriations in PY-1987 and base appropriations in FY-1988-90 to increase soil survey production to respond to the need for information to implement Conservation Reserve, Sodbuster, Swampbuster, and conservation compliance provisions of the 1985 Farm Bill.

Ability to handle the additional Farm Bill workload assumes moat states will need to maintain at least current levels of staff through 1990. A few small states are considered to be below maintenance level staff and would be increased.

Significant increases in total production necessary in 10 to 15 states with large acreages that need to be mapped to comply with the '85 Farm Bill will obviously require additional staff:

1. Some additional permanent full-time soil scientists,
2. Maximum utilization of extended seasonal details,
3. Maximum use of adjusted work schedules, including overtime where possible.

A concerted effort is being made in PY-1986 and will continue in PY-1987 to provide soil survey project offices with FOCAS equipment to facilitate all phases of text and data processing • aaociated with the production and use of soil surveys.

Procurement of imagery and soil map materials needed to facilitate field work and map finishing phases will continue to be a serious problem; a source of concern; and constant aggravation until every individual soil survey project need is met. We simply must be: as real about what is possible; as patient as we can; honest enough to restrain our criticism of others until we're sure that we've done our part--AND NOT GREEDY.

You can expect a late summer--early fall report on the Soil Survey Productivity Improvement Program study to contain some recommended changes with regard to some of the thing8 we do; some of the ways we do those things; and where we may be located when we do them.

Dr. Donald McCormack has announced hi8 retirement; effective June 30, 1966.

Major activities in the Soil Geography Are8 reported by Bill Reybold include.

State General Soil Map Activities; the 1:250,000 scale project,
Continuation of the update of small scale map8 of African Countries,
Continuation of the update of small scale world soil map,
Continuation of effort8 to integrate all available soil data bases with developing geographic information systems.

A National Workshop for State Soil Scientists is scheduled for October 27-31, 1986; probably in the Washington, D.C. area.

NCSSC:
Columbus, Ohio
6/16-20/86
J.E. Witty

SOIL TAXONOMY AND THE INTERNATIONAL SOIL CLASSIfICATION COMMITTEES

The purpose of this report is to review the activities of the International Soil Classification Committees and to encourage active participation in these committees. I am also leaving plenty of time for questions to make sure that I cover as much as possible the topics in which you are most interest rd.

The committees were organized to help coordinate the improvement of Soi 1 Taxonomy and to make it a comprehensive system. The committees have an open membership and the chairmen of the respective committees correspond with the member ship by "Circular Letters".

I believe it is fair to say that most of the committees have concentrated on trying to make Soil Taxonomy more useful in areas where little soils data was available at the time it was published. Soil Taxonomy is considered a _de facto_ international soil classification system, and I think this is due to the work of the committees.

I believe we all benefit from maintaining Soil Taxonomy as a comprehensive syst em. If we had looked only inward, in other words, if we had only considered the soils of the U.S. when developing and maintaining Soil Taxonomy, the committees would not have been needed. I like Guy Smith's thoughts on why we should look "outward" for help with Soil Taxonomy. He writes: "A comprehensive system should 1 et us see the soils of the United States in better perspective." He continues, "If one develops a classification of the soils of a single country, he will only by accident develop a classification that will be useful in other countries....A classification developed for a country becomes warped by the accidents of geology, climate, and the evolution of life in that country, and is apt to reflect soil genesis in a manner that appears distorted to one familiar with the soils of a di fferent country. .." In his opinion a comprehensive system should also aid in the transfer to this country of experience gained in other countries.

There are 8 International Committees, as follows:

1. ICOM on Low Activity Clay (ICOMLAC) chaired by F. Moor mann;
2. ICON on Oxisols (ICOMOX) chaired by S. Buol;
3. ICOM on And i sol s (ICOMAND) chaired by M. Leamy;

4. ICOM on Moisture Regimes (ICOMMORT) chaired by A. Van Wambeke;
5. ICOM on Aridisols (ICOMID) chaired by A. Osman;
6. ICOM on Vertisols (ICOMERT) chaired by J. Comerma;
7. ICOM on Wet Soils (ICOMAQ) chaired by J. Bouma; and
8. ICOM on Spodosols (ICOMOD) chaired by R. Rourke.

The International Committee on Low Activity Clay completed its mandate about two years ago. Since that time the proposal was sent out by the Soil Conservation Service for testing. Last winter the comments were evaluated and incorporated into the final amendment. Through the spring it has gone through additional testing, with a few changes made. The amendment is essentially ready to be released, but Frank Moormann made a special request to look at it one more time before we release it. We are waiting for his final comments.

The major changes resulting from this amendment are:

1. The introduction of a new diagnostic horizon, the kandic horizon, which is identified on the basis of (a) having a clay increase similar to that defined for an argillic horizon, and (b) having a CEC of ≤16 meq/100 g of clay (In some cases the kandic horizon will also be recognized as an argillic horizon), and

2. The introduction of "kandi" and "kanhapl" great groups of Alfisols and Ultisols. These great groups parallel the

examined and classified. The purpose of the workshop was to help solve the remaining problems with the Oxisol proposal. I thought the workshop was very successful, and good agreement was reached concerning the final format of the proposal.

Acceptance of the ICOMOX proposal will have little impact on the classification of the soils of the United States, because the SCS only recognizes about 39 soil series classified as Oxisols. These are in Puerto Rica, Hawaii, the Trust Territory, and Guam. It appears, however, that all 39 series will require reclassification.

The International Committee on Andisols was established in 1978 after Guy Smith prepared a report recommending that a new order, Andisols, be established. Progress has been steady with this committee, and hopefully it will submit its final proposal to SCS by late 1957.

Two events have been scheduled to aid in finalizing decisions. The first is an International Soil Correlation Meeting which will be held July 20 to 31, 1986 and will be the first such meeting held of this type. At this meeting we will concentrate on examining a wide range of "Andisols" in Idaho, Washington, and Oregon. Participation in the International Correlation Meeting is restricted to about 40 people mostly for logistical reasons - one being that only one bus will be required. The correlation meeting will not be as "international" as the workshops, in that only 4 other countries will be represented besides the U.S. Most of the participants will be from the West or Northwest.

The second event is the 9th International Soil Classification Workshop scheduled for July, 1987 in Japan. At this workshop decisions should be made on all remaining problems with the ICMAND proposal, and the final proposal is expected to be received by the SCS in the fall of 1987.

The International Committee on Moisture Regimes has been "on hold" for the last 3 or 4 years. In 1982 the committee had decided that they had done about as much as they could do based on the current research on soil moisture at that time. SCS has not followed up on the committee's proposals. The proposals consisted basically of subdividing the existing soil moisture regimes into three subclasses each. We are trying to revive the committee to either develop a new model or improve the Newhall Model. It is generally felt that we could test the ICOMMORT proposal, but we need a better mechanism for applying the 1 imits when making soi 1 surveys.

Ron Paetzold is working on soil moisture and temperature regimes and is making an inventory of the ongoing and completed studies conducted in the U.S. He will also help evaluate existing models to determine if it is practical to use or modify them for use to estimate soil moisture and temperature regimes. Two possible models are the SFAW model developed by Keith Saxon of Pullman, Washington, and the CEEAMSTAX model, which is a modification of the CREAMS model.

The International Committee on Aridisols has progressed slowly. The third International Soil Classification Workshop was held in Syria and Lebanon in 1980 to address the taxonomy of soils in arid zones of low latitudes. The workshop was quite a success as far as identifying problems in the management and classification of these sails, but there was a lack of significant follow-up by ICOMID. Recently there has been an increase in activity, and currently there are plans to hold an International Soil Correlation Meeting on Aridisuls in 1987 in the Southwestern part of the U.S.

In the past the committee concentrated on Aridisols with accumulations of carbonate and gypsum and tried to define a couple of new diagnost ic horizons, the hypergypsic and hypercalcic horizons. Now there is a more general feeling that the whole order should be examined. At present there are only two suborders recognized. but if the [illegible]

(c) Should drained soils be distinguished on the basis of taxon criteria or phase criteria? (d) Should soils that are saturated for periods of time but do not become reduced be recognized at the subgroup level? (e) Should morphometric criteria be used to define aquic suborders, or should they be identified on the basis of measured periods during which they exhibit reducing conditions or on the basis of depth and season of watertable? Dr. Bouma is planning to complete his mandate by 1988.

The International Committee on Spodosols has had a difficult time. Ted Miller was selected as chairman when the committee was first established. tie resigned, however, when he retired from the SCS, and Bub Rourke accepted the chairmanship. A large Spodosol data base has been established, and the data base is being manipulated to test di f frrent hypotheses. A major problem, however, is that the data base, for the most part, is based on our standard soi 1 analyses, and it has been manipulated to death over the last 20 years. We need new analyses to test the Spodosols, and certain Universities and Countries are trying new analyses but they are very expensive to screen. Some of the new tests may give good separation among the local soils tested, but the tests disintegrate when a wide spectrum of soils are used. The only thing on which we can get good agreement is that if it looks like a Spodosol we should classify it as a Spodosol.

This comp 1 et es my discussion of the established ICOM's. Recent 1 y, however, we have received recommendations to establish two more ICOM's, one on soil families and the other on Histosols. The one on soil families would be a follow-up to Pen Hyjak's work on soil families. The other would be to fill in gaps in the Histosols at lower latitudes.

At one time it was thought that additional committees should not be established until most of the established ones had completed their mandates. Over all, I thin):: the committees have been quite successful. It is not a very efficient approach to improving Soil Taxonomy, but I do not know a better one.

Group Discussion and Quest ions ---

SOIL SURVEY SOFTWARE DEVELOPMENT TEAM

Fred Minzenmayer

TEAM COMPOSITION

FIELD SOIL SCIENTISTS (3)

Bob Kukachka - Soil Survey Party Leader - Burley, Idaho
Mike Rlslnger - Soil Scientist - Lubbock, Texas
Joe Stelger - Soil Survey Party Leader - Zanesville, Ohio

STATE OFFICE STAFF SOIL SCIENTIST (2)

Dick Babcock - State Soil Scientist - Orono, Maine
Fred Minzenmayer - Asst. State Soil Scientist - Salina, Kansas

STATE OFFICE STAFF RESOURCE CONSERVATIONIST (1)

Dan Nanson - RID Coordinator - Spokane, Washington

NTC STAFF SOIL SCIENTIST (1)

Oliver Rice - Soil Correlator, NENTC - Chester, Pennsylvania

NHQ STAFF SOIL SCIENTIST (1)

Bill Reybold - National Leader for Soil Geography - Washington, D.C.

FOSDT REPRESENTATIVE - AC OR DC (1)

Rick Perritt - State Resource Conservationist

OBJECTIVES

1. Develop an automated system to increase the efficiency of making soil surveys.

2. Provide for more efficient data collection and data availability through the use of computers at all organizational levels.

3. Integrate with field office relational data base.

APPROACH TO SOFTWARE DEVELOPMENT

1. Define requirements - document every function in soil survey

2. Build prototype

3. Test and refine

STRUCTURED SYSTEMS ANALYSIS

Def. The underlying concept is the building of a logical (nonphysical) model of a system, using graphical techniques which enables users, analysts, and designers to get a clear and common picture of the system, and how it fit8 together to meet the user's needs,

OBJECTIVES OF SOIL SURVEY SOFTWARE

BROAD OBJECTIVES

A. Simplify data entry

B. Increase the usefulness of data - once entered, it can be used in a variety of ways

C. Make soil surveys more efficient

DETAILED OBJECTIVES

1. Enter data one time

2. Eliminate data duplication

3. Access to all data entered

4. Ability to summarize

5. Modeling capability

6. Maintain national and/or state data bases in up-to-date condition

7. Automatic update of field and state data bases

8. Access to national and/or state data bases by field soil scientists
9. Eliminate inconsistency of data
10. Permanent storage of all documentation in useable form
11. Links to other disciplines
12. Input to GIS
13. Management and planning capability
14. Menu-driven, interactive
15. Data files transferrable
16. Data entered in same format as collected
17. Data entry near point of collection, and by collector when possible
18. Error checking-against standards and against format and codes
19. Ability to classify data status
20. Audit trail
21. System must be flexible and adaptable to changes in procedures, standards, and policy
22. Flexible presentation format
23. Menu-driven or prompted query system for output
24. Capability for ad hoc query
25. Statistical capability
26. Data integrity
27. Good user documentation

PRIORITIES

1. Design of core data base
2. Integrated software
3. Standard field note data set
4. Good software documentation
5. User support service
6. Software update service

7. Instructions and examples of queries

8. Joint development of programs for soil performance data

9. SSWG followup meeting

SOFTWARE MODULES

1. Upgrade SCS-SOI-232 program (taxonomic unit descriptions)
2. Map unit descriptions
3. Field notes
4. Acreage tables
5. Similar and dissimilar soils list
6. Transect analysis
7. Menu-driven summary tables

a. Generate interpretations and potentials

9. Lab data and index
10. Scheduling, project management
11. SCS-SOI-5's and OSED's in field computer

CARTOGRAPHIC SUPPORT OF SOIL SURVEYS

Lee Sikes

The National cartographic Center, Fort Worth, Texas, helps to support the soil survey program As follows:

(1) Obtaining imagery - mapping and publication
(2) Preparing photobases end related overlays
(3) Preparing final publication negatives
(4) Preparing General Soil and Index Maps And block diagram

In addition to the above, Cartographic sends and retrieves materials from the Federal Record Centers, prints interim copies of map sheets, prepares photographic enlargements of map Sheet6 and prepares duplicate line negatives of soil information.

Cartographic m-entered the arena of contracting for map finishing during FY86. To date we have contracted five jobs. Another four jobs will be contracted by the end of June, 1986. We expect this effort to grow, especially as state budgets are cut. Two full-time positions are presently working in contract map finishing.

Obtaining Imagery

Most of the imagery is obtained *fran* two main sources:

(1) ASCS, Salt Lake City, UT - NHAP-B&W-CIR
(2) USGS - Orthophotography

The average cost of a survey covered by NHAP-B&W-CIR stereo is $3250.00. Imagery generally will not be ordered until complete county coverage is obtained, because ASCS will hot prepare control cm partial county coverage. The average turn-around time for NHAP is 2 to 3 months.

USGS orthophotoquads now cost $60.00 each for reproducibles, $750.00 each for newly constructed quads.

The average eastern county takes approximately 15 orthoquads. The average western soil survey Area takes approximately 60 orthoquads.

The time required to obtain orthophotography ranges from five months (for reproducibles) to three-plus years (for new construction of orthos).

Due to the cost of getting ground control, USGS prefers to work a block of several counties at one time, rather than a single county. We are very dependent on their scheduling.

Preparing Photobases

This section has the greatest number of workers assigned to it and has produced the greatest number of jobs of all the sections in the NCSS Branch. Ideally, we would like to have six months from the acquisition of imagery until ship-rent of photobases to the state.

This year we will have a drop in production from 126 jobs (FY85) to approximately 90 jobs. This is happening because we have worked through a backlog of partially completed job which were transferred to Port Worth during Cartographic consolidation and we are now working with

CONTRACT MAP FINISHING

The following is a list of jobs that are presently in Cartographic:

1. Grant & Hardy Cos., WV
2. Guam
3. Avoyelles Pa., LA
4. Box Elder, UT
5. Greensville Co., VA
6. Sullivan co., NY
7. Ellsworth Co., KS
8. Pangvitch Ar., UT
9. Concordia Pa., LA
10. Gaston Co., NC
11. Williamburg Co., SC
12. Orangeburg Co., SC
13. Fremont Ar.,
14.
15.
16.
17.
18.
19.
20.

65	27
44	10
109	37

Regional Soil Taxonomy Technical Committee

RODNEY HARNER

The work of the committee has increased over the pest several years. Proposals for changes in Soil Taxonomy are referred to the committee plus additional people if there is a need for a wider review. The committee needs to give careful consideration to proposals from the international committees. The scope of the review of some international committee recommendations needs to be broadened. The committee membership is as follows:

Rod Hamer, Chairman
Neil Stroesenreuther (term expires June 1987)
Randall Miles (term expires June 1987; Ivan Jansen is replacement)
Gary Lemme (term expires June 1988)
Larry Zavesky (term expires June 1988)
Don Franzmeier (term expires June 1989)
Wiley Scott (term expires June 1989)

Ohio Capability Analysis Program

Wayne Channell

A Tool for Local Resource Management

One of the tools available to local Ohio government officials, farmers, businessmen and others in managing our land and water resources is the Ohio Capability Analysis Program. OCAP is a computer mapping and information storage and retrieval system for natural resource data.

OCAP stores on a county basis information on soils, geology, groundwater, land use end other natural resource data. One advantage in computerizing soil data such as permeability or shrink-swell potential is that information not mapped in a detailed soil survey can be produced in computerized map form and made available for use; another advantage is that natural resource data can be mapped at any scale and for any boundary (e.g. watershed, township, census tract) contained within the system. The primary edvantage. however, in computerizing natural resource data is the ease in analyzing and manipulating data to perform land capability analysis.

Lend capability analysis, whether accomplished manually or with the computer, involves studying and analyzing the natural resources of an area to determine if they are capable of withstanding or tolerating a given land use. For example, suppose a consulting firm were hired by a developer to select a prime site for a proposed residential subdivision in a community. As part of his research, the consultant would likely gather all of the natural resource base maps available for soils, slope, flood plain location, groundwater availability and existing land use. The next step would be to define for each base map what the acceptable and unacceptable environmental characteristics are for residential development. For example, only slopes between 2-6% may be considered as desirable sites while areas within the 100-year flood plain may be considered as undesirable. These determinations of what are considered acceptable and unacceptable character. istics must be made for each base map. After these decisions have been made the base maps or, if they have been prepared, color coded transparent overlays of each base map can be overlayed one on top of the other. This procedure will allow the consultant to visually determine where the best sites with fewest building and environmental restrictions for residential development would be located.

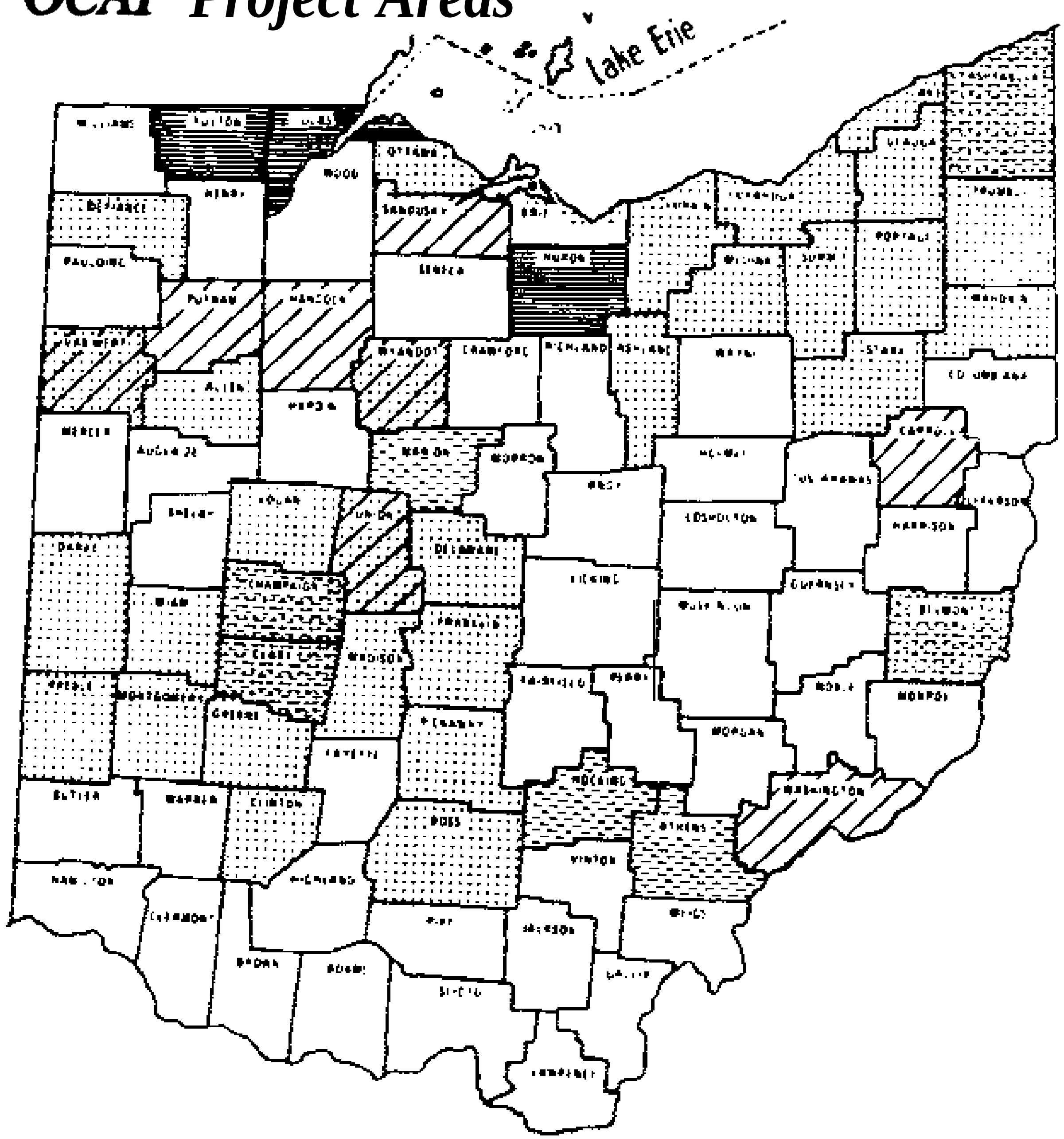
The process of land capability analysis can get very complicated. especially when it is completed manually and there are numerous base maps at different scales to overlay. OCAP solves these major obstacles in utilizing land capability analysis by letting the computer map, rescale, and overlay the base map variables. The output is a single map that illustrates the potential of the study area for residential development or for other designated uses such as sanitary landfill, large-scale industrial or commercial development, or recreation sites. OCAF maps and information are of value not only to the consultant or developer who wants to locate such projects but it is also of value to the home-owner or adjacent property owners where the proposed development will be located and to the local county, township and municipal officials responsible for reviewing and approving such projects,

Land capability maps and special analyses utilizing OCAP are also used by farmers and others interested in conserving local land and water resources. Through OCAP. soil erosion estimate maps can be produced illustrating the potential amount of soil which can beseved by adopting conservation or no-till farming over conventional tillage methods. Sewage sludge application maps are produced to delineate areas where municipal sludge can be safely applied to agricultural land to improve the soil structure and provide a portion of the nutrient needs for agricultural crops.

Currently, over 40 Ohio counties have an OCAP computerized natural resource data base, which local officials and others can use to make more informed and rational resource decisions, either completed or in progress. More details about each county's data base can be obtained by celling: Ohio Department of Natural Resources, Division of Soil and Water Conservation, (614) 2656778.

Status of January, 1985

OCAP Project Areas



Land Capability

Completed
33 COUNTIES & COASTAL AREAS

Active
3 Counties

Tax Assessment

Completed
8 Counties

Active
7 Counties

WYANDOT OTAX TEST RUN

Parcel Code	Parcel ID	Owner	Township Number	Section Number	Assessor Acres	computed Acres
					113.02	117.08

SOIL/SLOPE ANALYSIS

CODE	DESCRIPTION	ADJUSTED ACRES	PERCENT	CAUV/ ACRES	CURRENT AGRICULTURAL USE VALUE
	CROPLANO SOILS				
2	Belmore Loam, 0-2% Slope	3.72	3.3	430.00	1601.46
3	Belmore Loam, 26% Slope	2.77	2.4	430.00	1189.20
26	Haskins Loam, 0-2% Slope	7.23	6.4	540.00	3902.79
28	Hoytville Silty Clay Loam, 0-2% Slope	32.82	29.0	740.00	24285.47
30	Hoytville Clay, 0-2% Slope	11.98	10.6	740.00	8868.29
46	Nappanee Silt Loam, 0-2% Slope	6.12	5.4	350.00	2142.40
47	Nappanee Silt Loam, 2-6% Slope	1.99	1.8	350.00	696.93
48	Nappanee Silt Clay Loam, 0-2% Slope	25.15	22.3	350.00	8801.91
	PASTURELAND SOILS				
28	Hoytville Silty Clay Loam, 0-2% Slope	10.66	9.4	290.00	3090.44
30	Hoytville Clay. 02% Slope	2.99	2.6	290.00	866.18
46	Nappanee Silt Loam, 0-2% Slope	0.74	0.7	150.00	110.62
48	Nappanee Silt Clay Loam, 0-2% Slope	6.27	5.5	150.00	940.30
	WWDLAND SOILS				
3	Belmore Loam, 2-6% Slope	0.37	0.3	60.00	22.12
26	Haskins Loam, 0-2% Slope	0.07	0.1	60.00	4.42
28	Hoytville Silty Clay Loam, 0-2% Slope	0.07	0.1	60.00	4.42
46	Nappanee Silt Loam, 0-2% Slope	0.07	0.1	60.00	4.42
		113.02	100.00		56530.00 TOTAL
					500.18 PER ACRE

NO ACRES IN NON-CPW LAND USES IN THIS PARCEL

47

45

North Central Soil Survey Conference
Columbus, Ohio
June 16-20, 1986

Geology of Ohio

Mike Hanson, Geologist
Ohio Division of Geological Survey

Mr. Hanson made an excellent slide presentation and discussion on the geology of Ohio. Much of the discussion related to the formation, age, and kinds of both basement and surface bedrocks in three major basins in Ohio. These are the Michigan, Illinois, and Appalachian basins. Points of interest in the discussion were as follows: 1) Oil and gas production (about 140 wells); 7) Limestone shales, which are high in fossils; 3) Salt reserves in underground quarries. The reserves are sufficient to meet the needs of the United States for 32,000 years; 4) Shale high in oil and gas, similar in volume to that in Wyoming. Mining of these reserves is presently not cost effective; 5) Material in limestone quarries used for building purposes; 6) The probable thickness of glacial ice during deposition of till (estimated at 1000 feet); and 7) Traces of gold in some of the till and 5 diamonds found in the state.

Overview of Forest Service Activities

Paul Johnson, Forester
Forest Service - USDA

Mr. Johnson's thorough use of slides provided a most informative report on the organization, structure, and functions of staff personnel with emphasis on 20 Northeast states. The slide presentation related to current activities and various alternatives being used to address individual conditions or situations. The need for Prime Forestland ratings was a major concern. The responsibilities of Walt Russell and Pat Merchant, Soil Scientists with the U. S. Forest Service in this region, were briefly reviewed.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Illinois Report

The Soil Conservation Service provides most of the field work and supervision for the soil survey program. The University of Illinois assists in field reviews, correlation, laboratory support and research support. The University now has a four man professorial staff in pedology, as follows.

Thomas Bicki, our extension pedologist, has developed extension education programs to assist farmers in selection of soil management and tillage practices that reduce erosion and enhance production. His research program includes: 1) development of a soil suitability rating system for alternative on-site sewage disposal systems; 2) estimating potential degree of compaction In several topo-drainage sequences based on proctor density and uniaxial drained compression test; 3) quantifying spatial variability of lamellae in the substratum of coarse-loamy and sandy soils; and 4) Monitoring the leaching of Alachlor,Cyanazine, and Carbofuran in sandy soils under various tillage and irrigation practices.

Robert Darmody teaches our junior-senior level soil survey and Illinois soils course. Over the past year he has developed a lotus based laboratory data management program. The new program eliminates hand calculation of results and typing of the data. It will speed our turn around time and minimize errors.

Bob participated in a soil-parent material-landscape study along the Edwards River in Mercer County, Illinois. The study was successful in building a soil-landscape model to help the on-going soil survey In an area that had been poorly understood. He is also studying soil water as the Illinois representative to NC-109. A recently completed project found that chromas of two or less are good indicators of the depth and duration of soil water tables in east-central Illinois. Work currently underway is directed toward interpreting piezometer data collected over the last ten years or so by the Soil Conservation Service. John Tandarich, a Ph.D candidate under Dr. Darmody's direction, is beginning an Investigation of soil-landscape relationships in north-central Missouri.

Ken Olson teaches a soil management and conservation course. His research involves the following: 1) predicting crop yields from soil erosion and climate parameters, 2) measuring the effects of soil erosion and slope on soil properties and corn yields, 3) measuring the effects of land application of dredgings (lake sediments) and scrubber sludge (power plant) on crop growth and soil aggregate formation, 4) estimating soil loss from determinations of x-ray absorption coefficients using Rayleigh scatter'. and 5) measuring soil pore size distributions by Hg intrusion porosimetry.

Ivan Jansen teaches the graduate level pedology course. His research involves reclamation of strip mined land for row crop production and soil-landscape relationships. A masters project under his direction found soils down wind from wide sections of the Mississippi Valley to be weakly developed and in thick. light textured loess relative to those down wind from narrow valley segments.

The Soil Conservation Service in Illinois. has adopted computer aided manuscript preparation. Applicable sections from previous reports are transferred out, then the new pedons substituted, needed modifications made, etc. The result is considerable time saving and a considerable reduction in editing costs. One survey leader has began computer coding of pedon descriptions as they are taken. The narative description is then computer generated.

A current challenge to our soil survey program comes in the way of a court suit being filed by a group of Iroquois County farmers whose taxes increased as a result of the combinded effects of a new tax law and a new soil survey. SCS and University personnel are still meeting with the plaintiffs in an attempt to arrive at an understanding. We feel confident that our position on the issue is defendable should the matter reach the court room.

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Thomas, David and I. J. Jansen. 1985. Soil development in mine spoils. Journal of Soil and Water Conservation. 40:439-442.

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Jansen, I. J., W. M. Walker, and S. L. Vance. 1986. Soil survey vs. crop production as a measure of soil productivity: soil strength effects on row crop yields. Unpublished research report to the USDI Office of Surface Mining.

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Darmody, R.G. 1985. Weathering assessment of quartz grains: A semi-quantitative approach. Soil Scl. Soc. Am. J. 49:1322-1324.

Thorn, C. E., and R. G. Darmody. 1985. Grain-size sampling and characterization of eolian lag surfaces within alpine tundra, Niwot Ridge, Front Range, Colorado, U.S.A. Arctic and Alpine Research 17:443-450.

Thorn, C. E., and R. G.Darmody. 1985. Grain size distribution of the insoluble component of contemporary eolian deposits in the alpine zone, Front Range, Colorado. Arctic and Alpine Research 17: 433-442.

Darmody, R. G., I. J. Jansen, and S. G. Carmer. 1986. High extraction coal mining in Illinois: Effects on crop production in 1985. Report to the IMSRP-ISGS, 32 pp.

Olson, K. R. 1984. Use of multiple regression analysis and linear equations to predict soil productivity. American Society of Agricultural Engineering. Special Publication No. P84-ER02.

Olson, K. R. and G. W. Olson. 1985. Proposed use of agronomic data and enterprise budgets in assessment evaluations. Journal of Soil and Water Conservation. 40:455-458.

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Olson, K. R. and G. W. Olson. 1985. Total potassium analysis as a predictor of illitic mineralogy class. Soil Science. 140:243-250.

Olson, K. R. 1985. Identification of fragipans by means of mercury intrusion porosimetry. Soil Science Society of America Journal. 49:406-409.

Olson, K. R. 1985. Characterization of pore distribution within soils by mercury intrusion porosimetry and water release methods. Soil science. 139:400-404.

Olson, K. R., S. G. Carmer, and G. W. Olson. 1985. Assessment of effects of soil variability on maximum alfalfa yields, New York. Geoderma. 36: 1-14.

Olson, K. R. and G. W. Olson. 1986. Use of multiple regression analysis to estimate average corn yields using selected soils and climatic data. Agricultural Systems. 20:105-120.

Olson, K. R. and A. J. Bredberg. 1986. Measurement of pore distributions in a fine-textured soil. Proceedings of 12th Conference of Romanian National Society of Soil Science 12:98-110. (IN ROMANIAN).

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Indiana Report

For the last eight years Indiana State Board of Health (ISBH) has been promoting the use of specific soils data such as texture, structure and color as tools to evaluate sites for their capability to successfully support an on-site sewage disposal system. The ISBH has determined these soil properties are much more accurate tools than the percolation test which has been used for years as the primary means of site evaluation. The ISBH has recently had an opportunity to employ two professional soil scientists to provide assistance to county sanitarians (CS) in the area of soils evaluation for on-site sewage disposal systems.

Even with the major increase in ISBH staff, the sophistication of CS staffs and the willingness of CS staffs to utilize the more specific data has outstripped the ability of ISBH staff to respond to all CS requests in a timely manner. The Soil Conservation Service (SCS) indicated a continued willingness to provide some assistance in this area.

The ISBH and SCS come to an agreement regarding site survey requests. In general terms, the agreement states that the SCS will conduct the on-site evaluations ISBH is unable to handle because of time difficulties. One stipulation of the agreement is that the local sanitarian must accompany the SCS soil scientist during the site survey.

The ISBH will still fulfill as many of the site survey requests as they possibly can. In order to make their job easier as well as to assist the SCS a request form was developed.

The guidelines for"Soil Conservation Service Review and Assistance to Indiana State Board of Health for Certain Sanitary Projects" are in the remainder of this report.

Purpose

Operating procedures of the Indiana State Board of Health (Board) require on-site investigations of certain sites for sanitary facilities. These guidelines are set forth jointly by the Board and Soil Conservation Service (SCS) in order to provide timely SCS reviews that furnish needed data and information to the Board or their representative.

Procedure

SCS assistance will be made available to the Board to assist in their workload for all residential and commercial sites involving sanitary facilities. SCS will do only sites the Board can not service. SCS will train county sanitarians and the Board's employees in all aspects of soil survey applicable to on-site septic tank-absorption field disposal systems.

The assistance procedure will be as follows:

1. The Board (or their representative) will fill out the applicable part of the request form and send two copies of the "Request for Assistance for On-Site Septic Tank-Absorption Field Sewage Disposal System", Exhibit #1, plus a copy of the proposed site location to:

   State Conservationist
   USDA - Soil Conservation Service
   5610 Crawfordsville Road, Suite 2200
   Indianapolis, Indiana 46224

2. The State Conservationist will forward the request to the Area Conservationist (AC).

3. The AC will return the completed request with any additional appropriate information to the SCS state office. He will keep a copy for his file.

4. The state office will forward one copy of the completed request to the Board (or their representative).

   Note: Forty working days will be considered adequate time from time of receipt by SCS to time of return to the Board.

5. The Board will encourage its staff (or their representative) to contact the appropriate AC when it is apparent that more information or on-site consultive assistance is appropriate. The additional information furnished to the Board will be documented in writing to the State Conservationist.

6. The Board will notify the appropriate AC directly when public informal informational meetings are to be held in a particular county, with notification including time and place.

7. SCS on-site for residential septic tank-absorption field sewage disposal systems will be made only when the SCS staff person is accompanied by the county sanitarian and the owner is encouraged to accompany the county sanitanian.

8. SCS on-site for commercial septic tank-absorption field sewage disposal systems will be made only when the SCS staff person is accompanied by a representative for the commercial enterprise and the county sanitarian is encouraged to attend.

9. The Board will be informed on training sessions held by SCS that will benefit the Board in using soils information.

10. The Board will inform SCS of training sessions that will assist SCS in completing the request for on-site septic systems.

The Board and SCS will distribute these guidelines to all appropriate personnel. These guidelines will remain in effect as set forth unless modified by agreement of both parties. This document may be terminated by either party at any time.

Woodrow A. Myers, Jr.
Commissioner
Indiana State Board of Health

Robert L. Eddleman
State Conservationist
Soil Conservation Service

North Central Soil Survey Conference

Purdue

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Iowa Report

A cooperative study between the Soil Conservation Service and Iowa State University was initiated in 1983. The major objectives of this study are to determine the effect of past erosion on corn yields and to identify those soil properties that have the greatest effect on yield. Sites of slightly, moderately, and severely eroded soils were selected in two to three fields in each of 10 counties in 1983 and in 44 counties in 1984 and 1985. Climatic, soil, yield, and management data are collected by the Soil Conservation Service at each site. Soil test results for each soil horizon are determined and corn leaf samples are analyzed for N, P, and K. Statistical analyses are completed by using multiple linear regression techniques to determine the effect of past erosion on corn yields. Results to date show a greater reduction in corn yields on soils derived from till and paleosols as compared to loess-derived soils. A slide set and tape were developed to inexpl[illegible]

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Kansas Report

I have two activities to discuss with you, Crop Yield Update and Erosion-Productivity Study.

Kansas has soil surveys that were completed between 1948 and the present. In 1981 we updated the soil surveys by putting interpretation tables, those used in the current soil surveys, in the technical guides. This year we updated the wheat and srain sorghum yields for all published surveys, and they will become a-part of the technical guide.'

We used the following procedures to set our yields.

1. Determined the ten year county average from Kansas State Board of Agriculture annual reports,

2. County average yields were increased 20 percent to obtain county average yields for high level management.

3. Numerical rating factors were assigned based on map unit and soil properties such as slope, depth, textural family, pH of surface layer, etc.

4. A computer program was developed using these factors, county average yields, and percent of each arable map unit in the county to compute the crop yield for each map unit.

Erosion-Productivity Study

In 1985 we collected data on two soils. This year we added three more series to our study. We selected 20 sites for each series with each site having subsites for three topsoil thicknesses that approximate the none to slight, moderate, and severe erosion classes. All three subsites are located in the same field so the management practices are constant for the different erosion classes. Soil samples were collected for each erosion class at three sites for each series plus three sites in native range. We collected data on grain yield and on the amount of residue/acre on each subsite.

Our first year results show that each inch of topsoil lost lowers the yield about 1.3 bushels.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Michigan Report

The soil survey party in Cheboygan County, Michigan has completed two studies to aid them in producing a high quality and efficient inventory of the soil resources in the county. The Ocqueoc Lake Plain occupies approximately the northern 2/3 of the county. This plain has been influenced by wave action and sedimentation of Glacial Lake Algonquin and Lakes Nipissing and Algoma. Scarps were located on topographic maps and soils were mapped on randomly selected 65 ha plots. The altitude and soil properties were related to the five surfaces on the Lake Plain. Spodic horizon development was not necessarily related to age; rather it appeared to be controlled by the length of time under aquic moisture regime conditions.

Field identification of spodic horizons is a problem for soil survey parties and the Cheboygan party was no exception. However, they developed a micro-morphological approach to identify spodic horizons. Transmitted light rather than reflected light and a 30X to 40X shop or hand-held microscope were used to observe cracked coatings and pellets. The sesquans and pellets observed in each sample were rated from 1 to 4; 1 being very thin sesquans, 2 being thin, 3 being thick and 4 being thick sesquans with pellets. The color of each horieon was given a numerical rating (soil color index). The soil color index (SCI) equals 40-(value x chroma). A strong relationship ($r = .97$) was obtained between soil color index and sesquan rating.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Minnesota Report

We are testing 'real-time' acquisition of color infra-red photography in several surveys at scales of about 1:8000 and 1:20,000. This is uncorrected photograph (for distortion or geometry), but available at costs ranging from $2.50 per aq mi to about $10.

We are locating microcomputers with a number of survey parties for manuscript development, documentation, and data gathering (water tables, yields, etc). Experience of two survey parties in the past few years suggests that this will significantly facilitate manuscript development.

Major effort continues on computer storage of completed surveys and development of software for display of sections (or parts thereof) for soil attributes and problem analysis (erosion, land use/cover). Capability to display a 7.5 min quadmap with 'window' has been developed. This uses higher rcaoltuion graphics which can be made available for our county baaed information ayatema.

A system has been developed in cooperstin with CENEX end SOILTEC (see brochure) to digitize a soil map of a field (or if no soil map is available, of an image-analyzed color lnfra-red photograph) and to display this map on an on-board computer in the fertilizer delivery vehicle. The vehicle's field location is registered by radar navigation. Application rates of fertilizers, herbicides, and seeding rates can be adjusted to soil conditions within the field.

Water table observations gathered over the years in each survey (or longer on some soils) have been stored and processed to produce horizon or depth probability charts showing the moisture condition for the growing season.

There is an intensive effort to collect and store in computer retrievable farm forest and soil inventory data to aid interpretation's for wildlife managers and timber producers.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Missouri Report
by
Samuel J. Orr

Missouri's State Funded Soil Survey Acceleration

I am very pleased to represent the State of Missouri today. Many of you have heard of our Parks and Soils Sales Tax which has brought dramatic growth to our Soil and Water Conservation Program and a proper level of operating and construction funds to our Division of Parks, Recreation and Historic Preservation. A very good synopsis of this program is available to you in the May-June, 1986 issue of the Journal of Soil and Water Conservation on pages 152-155.

This is a soil survey conference, and I wish to speak to you about Missouri's accelerated soil survey program. To do this, I will discuss the development of the plan, its initiation, progress to date and take a guarded look to what the future may hold.

Missouri's soil survey acceleration program was developed in the mid 1970's because the time was right. Missouri land was coming under increasing pressure from urban expansion in not only St. Louis, and Kansas City, but also Springfield, St. Charles, St. Joseph and other areas. Surface coal mining in the state was expanding at the same time as public awareness of the problems associated with strip mining was growing. And expansion of recreational facilities such as Lake of the Ozarks and Silver Dollar City were pointing out the need for soil information for proper facility siting. While the demands for soil information ware growing, the Soil Conservation Service budget and personnel ceilings were being restricted.

Drs. C. J. Johannsen, and C. L. Scrivner of the University of Missouri. Dr. Bob Grossman, on IPA at the University from the Soil Conservation Service Lincoln lab, and Mr. Jim Lee. SCS State Soil Scientist at that time, collaborated on how an acceleration of our State's soil survey could be accomplished. State funding was realized to be the most viable source due to federal budget constrictions and uncertainty of funding at the county level.

Since the Soil and Water Districts Commission is the state agency that works most closely with SCS, and soil surveys are done in cooperation with soil and water conservation districts, this group approached the Commission with their proposal. Jane Johnson of the Commission staff utilized concepts from Inidana, Virginia and other states in drafting a proposal for a lo-year acceleration program.

We believe the adoption of our acceleration program is the result of <u>what</u> we proposed, <u>how</u> we submitted it and <u>who</u> we had in our corner. Our acceleration is a four-pronged approach. We asked for 1) personnel to accelerate field mapping, 2) funds to accelerate publication work, 3) increased research funds and 4) additional monies to permit accelerated information/education programs.

Betty Broemmelsiek, Chairman of our Commission at that time, submitted our proposal in written form to key legislators. This proposal included a description of what a soil survey is,a statement of what soil related problems our state faces and how soil surveys can help solve those problems, information about how the different agencies contribute to soil survey and finally a detailed budget of how the requested funds would be spent for the entire lo-year period.

Since the president pro-tern of our Senate was a staunch supporter of soil conservation districts, and we had prepared a comprehensive policy analysis to support our proposal, we received initial funding in fiscal year 1978. So that is how our acceleration was developed and initiated.

Now, a few words about our progress to date. We were not able to stay on our intended ten year plan. Through fiscal year 1981 we were progressing well and had 16 of our intended 30 Department of Natural Resources (DNR) field soil scientists hired and a total program budget of over $500,000 per year. Then came the recession. Its effects hit our state revenues in 1983 so that in fiscal year 1984 our budget was cut almost in half resulting in a reduction to 12 field soil scientists and loss of our ability to fund map finishing, research and information/education acceleration.

Our progress to date is evident when one considers that 27 counties had completed soil survey mapping in 1977 and in 1985 we have mapping completed in 62 counties. State hired soil scientists have mapped over 4,337,000 acres. Scrivner's Productivity Index, utilized by Larson in Minnesota, was developed in large part through soil survey acceleration funds as were studies in soil water movement, and stone line development in Ozark soils.

Our future can best be estimated by considering factual projections and then reviewing what we feel are the keys to our past success. We hope to complete mapping by 1992, 1995 at the latest. Our acceleration in map finishing, research and information/education have been reinstituted with the advent of revenues from the Parks and Soils Sales Tax. This tax has a sunset provision in it and will end August 6. 1989. Depending on availability of funding past this date we will adapt our program to our available resources.

In summary, our program has been successful because it was based on a careful and accurate assessment of both the problem of inadequate soil information and the effectiveness of soil surveys to answer this need; because all agencies involved are cooperative and supportive of each other; because we (there are no "theys" in a cooperative venture) have banded together to develop needed adaptations to our program as necessary; and because we were attentive to political realities such as a need for an objective criteria system for selection and prioritization of districts for initiating soil surveys and placing state hired personnel.

I have presented the concepts behind our state funded soil survey acceleration. I appreciate the opportunity to speak before you and will be most happy to supply further information you may desire.

Additional Activities of the Soil Conservation Service,
Department of Natural Resources, and the University of Missouri

1. Dr. Nyle Wollenhaupt has 'filled the position vacated by Chris Johannsen at the University of Missouri. Nyle came on board in July 1985. His appointment is 80 % extension, 20 % research in the areas of soil survey and land use.

2. Richard David Hammer will join the Department of Agronomy this Fall with an 80% research, 20% teaching pedology appointment. He fills the position vacated by the retirement of Clarence Scrivner.

3. A soil characterization laboratory funded through Constitution Amendment Two funds administered through DNR has been initiated at the University of Missouri. This laboratory consists of two full-time research specialists and will add to and supplement the data base of the National Soil Survey Laboratory.

4. Two erosion/productivity projects are underway. One under the direction of SCS is assessing corn production as influenced by various degrees of erosion in northern Missouri. Many of the same trends are found as in the erosion/productivity study in Iowa.

   A second erosion/productivity study is centered on forage productivity in south-central and southwest Missouri. Cool and warm season grasses and legumes are being utilized in small plots and pasture/grazing situations of Clarksville and Creldon soils.

5. Two studies are underway to assess water movement and zones of saturation in Ozark landscapes. Parts of these studies are associated with the NC-109 research project. Other phases are assessing the suitability of these soils for on-site waste disposal and the occurrence of Alfisols and Ultisols in various landscape components.

6. Funds have been allocated from Constitutional Amendment Two monies to assess degree of erosion and landscape stability on cultivated and uncultivated landscapes in Northern Missouri. Work is presently being initiated.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Nebraska Report

An innovctivc cpprocch to subsurface coil investigation is the use of ground-pcnetrcting radar (GPR). A GPR reconnaissance study was held in the Nebraska Sandhills in September 1985. The objective of this study was to assess the value of SPR in detecting crossbedding within sand dunes, depth to water table, lithologic discontinuities and bedrock. Participants in the ● tudy included personnel from the SCS state and regional office8 and from the National Soil Survey Laboratory, the Bureau of Reclamation, Natural Resource Districts and the University of Nebraska. The GPR was opcrctcd by James Doolittlc, SCS, Soil Specialist, Northeast NTC, Chester, PA.

The equipment utilized during thim study was the SIR Symtcm-S with microprocessor, the ADTEK SR-8004H graphic recorder, and the ADTEK DT-6000 trpe recorder. The 80, 120, and 300 MHz antennas were used at various times end under differing soil conditions.

The GPR provided data on the internal lithologic mequcncec and thicknesses of dunal sand deposits, assessed the nature of the underlying strata, and profiled soil horizons. Following initial calibration end field trials, the GPR provided encouraging results.

In the Sandhills, the best balance of resolution and depth of penetration was achieved with the 120 MHz antenna. the SO MHz antenna did not significantly extend the radar's probing and was noticeably inferior to the 120 MHz ● ntcnnm in its ability to discern subtle ● ub8urfacc interfaces. RI though the 500 MHz antenna provided greater resolution of near surface features, it was more depth restricted.

Though the literature has alluded to the potential for deep radar profiling in coarse textured, upland soils (40 to 70 feet), clear and consistent profiles were obtained with the present GPR system to depth8 of about 20 feet in areas of Valentine (mixed, mesic Typic Ustipsamments) soils. The more rcrtricted then expected probing dcpthm ccn be cttributcd, in part, to the occurrence of thin multiple bands of lamellae within the profile. Lamellae contain small amounts of illuvial

Depths were further restricted by layers having high contmnte of silts and clays, high concentrations of soluble ● alt8, and/or saturated conditions. In areas of Sandose (sandy over loamy, mixed, mesic Typic Haplustolls) soils, the radar provided a high quality graphic picture of soil horizons and features to the more impervious 2Bw horizon. The higher clay content of this horizon rapidly dissipated the radar's energy ● d restricted the probing depth. In areas of Duda (mixed, mesic Typic Ustipsamments) and Valentine soils, the GPR provided a highly detailed profile and traced the depth to and thm lateral variations of the upper contact of the Ogallala formation. However, little information was provided by the GPR below this carbonate enriched upper contact.

GPR is an interesting and useful tool and this preliminary etudy has shown that it is applicable to the Nebraska Sandhille. The results were encouraging particularly in the GPR's ability to detect discontinuities and bedrock. However the GPR's inability to detect crossbedding within sand dunes and water tables was disappointing. Additional field study is needed to ● seess the usefulness of GPR to the Nebraska Soil Survey program as an investigatory tool.

Hark Kuzila
Conservation and Survey Division
University of Nebraska-Lincoln

NORTH CENTRAL SOIL SURVEY CONFERENCE

colurnbus, Ohio, 1986

North Dakota Report
by
Cornelius J. Heidt

SUMMARY

Msnuscrlpt Technlclan Posltlon

North Dakota has recently created a GS-6 Manuscrlpt Technician posltlon In the State Soll Survey Offlce. In addition to regular secretarlal duties the posltlon Includes:

A. Edltlng

1. Pre-editing <grammatical and technlcal) representatlve ser les, mapplng unlt, and assoclatlon descrlptlons for party leaders.

2. Typing, edltlng, and putting descrlptlve legends on word processor.

3. Dolng the same with the manuscrlpt after comprehenslve review and also sdltlng the prewritten materlal and speclal sections.

4. Maklng changes on the word processlng dlsk after technical and grammatlcal edlts and submlttlng corrected disk for publlcatlon when all edltlng changes have been keyed.

5. Advantages of thls posltlon for edltlng are:

   a. Insures the manuscrlpt ls ready for the technlcal edlt by flnal revlew

   b. Frees other staff members to do other thtngs

   c. Editlng process more thorough and speeds up process In both the State Offlce and at the Technical Service Center

   d. Equlpments used ls compatlble wlth that at the Technlcal Servlce Center - data could be sent vla modem communlcatlons.

B. SCS Soils-5's and 6's

1. Soils 5's ordered and retrieved from Statistical Laboratory et Ames, Iowa at any time using word processor capabilities.

2. Soils 6's data are stored at the Statistical Laboratory using word processor capabilities. This data is then retrieved for field correlation documents, manuscripts, and final tables.

3. Data is stored on word processing disk and submitted to the Technical Service Center.

4. Advantages are:

   a. TSC only needs to make changes on field correlation disk to prepare final correlation document.

   b. Harris is not tied-up.

   c. Ready access and more control.

   d. Easy to make corrections on tables.

   e. Tables and Form 5's are printed at a scale suitable for standard size (8½ x 11) paper. No time-consuming copy machine reductions necessary.

Research Studies

North Dakota has three studies underway that involve collecting yield data. These are cooperative studies between the Soil Conservation Service and the Agricultural Research Station (ARS) or the North Dakota Agricultural Experiment Station (NDAES).

A. Statewide Yield Study

This study involves collecting wheat and sunflower yields and has been underway since 1981. It is an on-going study that involves all project soil surveys as well as additional counties. The objective is to establish relative yields on "benchmark" series and phases. The intent is to incorporate the data with NDSU plot research and Extension Service data to update yield tables and productivity indexes for North Dakota soils. Wheat protein and straw weights, and sunflower oil content data are also being collected.

B. Overburden Study

Yields on soils cultivated for more than 30 years will be compared to those on soils cultivated for less than 5 years. Soil parameters will be compared between sites on the two fields as well as sites in native range. Particular emphasis is on erosion and depositional sites.

C. Impact of Erosion on Till Soils in North Dakota

The objectives of this study are to determine yield changes due to deposition or removal of soil material, thickness of A horizon lost or deposited, how soil losses are accelerated with time and tillage, organic matter reductions due to removal or less formatton, and cost of N, P, K lost.

D. Mapping Unit Composition Study

Statistical analysis of mapping unit composition has been used on an optional basis in North Dakota for several years. Statistical methods and methods of obtaining data have varied with counties. In an attempt to standardize methods and insure the data reported is reliable, a pilot project has been initiated to compare the various methods being used to obtain mapping unit composition data and the various methods used to statistically analyze this data.

Digitizing Soil Maps

A. DesLacs-Souris River Basin Study

The Soil Conservation Service and the Extension Service are involved in digitizing soil maps for 180 sample units (quarter-sections) in a 6 million acre study area. The digitized soil maps will be married with soil characteristic data from Soils 5's, technical guides, and soil survey reports and field obtained land use data. This will allow for many interpretative maps and summaries of the data to be produced for the sample units and projected to the study area.

B. McHenry County

The North Dakota Agricultural Experiment Station has completed the digitizing of over 80 percent of the soil maps in the Irrigation Districts (250,000 total acres). Hand digitizing is being used.

C. Measuronics

The Soil Ccnservation Service and UND Geography Department (Remote Sensing Division) are cooperative in an effort to test the feasibility of transferring noncontrolled base soil maps to control base maps with the use of measuronics.

D. Control Base Maps

All mapping in new project soil survey areas in North Dakota will be on 1:24,000 control base maps. This is being initiated to facilitate digitizing.

Contract Mapping

The North Dakota State Soil Conservation Committee provides funds for contract mapptng. The vast majority of the contracts go to private contractors (Registered Professional Soil Classifiers in North Dakota) with the Soil Conservation Service providing quality control. On occasion, the Soil Conservation Service has contracted for a limited acreage. About 300,000 acres are contracted each years involving about $120,000. Future projections for contract mapping go as high as 700,000 acres per year.

NORTH CENTRAL SOIL SURVEY CONFERENCE

COLUMBUS, OHIO, 1986

OHIO REPORT
BY
KEITH HUFFMAN

RECONSTRUCTING PRIME FARMLAND IN OHIO

I. Background

Public Law 95-87, <u>Surface Mining Control and Reclamation Act of 1977</u>, was passed to enable the reconstruction and restoration of productivity of prime farmlands after surface mining for coal.

The final rules to implement PL 95-87 were published on May 12, 1983. The Secretary of Agriculture was assigned technical repsonsibility to develop the standard and specifications for reclaiming prima farmland.

Within 60 days of May 12, an interdisciplinary team of SCS staff in Ohio developed the first draft of standard and specifications. The draft was submitted to OSM, ODNR, mining industry societies, and SCS personnel in Ohio, Lincoln, and Washington.

Two subsequent drafts were developed and submitted for review. A forth draft was developed and submitted for review by all of aforementioned agencies and personnel plus the OFSWCD, Ohio Department of Agriculture, SWC Commision, OSU-Department of Agronomy, and the ARS Hydrologic Station at Coshocton.

Interim Standard and Specifications were accepted for use by OSM, ODNR, and SCS in February 1984. The standard and specifications are officially a part of Section IV of the SCS Field Office Technical Guide and consist of five sections - Removal, Stockpiling, Reconstruction, Revegetation, and Restoring soil productivity.

ODNR-Division of Reclamation distributed the interim specifications to their staff, the mining industry, and consultants in May 1984.

Between May 1984 and May 1986, the interim specifications were tested. A few minor changes were made in the specifications and the interim status was removed and final specifications issued in May 1986.

We understand that standard and specifications for four states will be published in the Federal Register soon.

Time does not permit me to go into many of the technical details of the specifications; however, I would like to address some of the difficulties we have encountered and discuss some approaches we have used in hopes that you can avoid similar difficulties.

1. Pressure to quantify bulk density levels for re-claimed soils.

2. Pressure to exclude fragipans as a part of the soil to be reclaimed.

3. Mining industry taking Second Order soil surveys at a scale of 1:1320 enlarging to scale of 1:400, overlaying two foot contour topo maps, and excluding normal map unit inclusions.

   This is done to reduce the acreage of prime farmland needed to be reconstructed.

4. Mining industry wants First Order soil surveys and on-site technical assistance, at no cost to them. Ohio is continuing to work on this.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

South Dakota Report

Vertisols of South Dakota

South Dakota has a large acreage of soils formed from the residuum of the Pierre shale which is dominantly west of the Missouri River. The moderately deep and deep soils were Vertic intergrades to the Haplustolls in the eastern extent and to the Camborthids in the western extent. These soils are the moderately deep Pierre and deep Kyle soils, classified as very-fine, montmorillonitic Ustertic Camborthids. and the moderately deep Opal and deep Promise soils classified as very fine, montmorillonitic Vertic Haplustolls.

From field observations, the soils appeared to meet the criteria for Vertisols. In 1984, a study was set up with the NSSL to study these soils to determine if the slickensides intersect and the tilt of wedge-shaped structural aggregates. The study showed that the slickensides intersected and the tilt was 20 to 60 degrees. These soils have about 60 percent clay, a bulk-density of 1.20 to 1.35, and COLE values of 0.10 to 0.14.

From the study, the soils did meet the criteria for Vertisols. The Pierre and Kyle soils are now Typic Torrerts and the Opal and Promise soils are Udic Chromusterts.

Over 3,000,000 acres of Vertisols have been added to the national total.

NORTH CENTRAL SOIL SURVEY CONFERENCE

Columbus, Ohio, 1986

Wisconsin Report
by
Gerhard B. Lee

The University of Wisconsin Program in soil survey

The Research Division of the College of Agriculture, University Extension and the Geological and Natural History Survey represent the University of Wisconsin, Madison, in soil survey. Fred Madison and Jerry Tyler, who are budgeted both in the Geologic Survey and in Soils, represent the Survey. Kevin McSweeney and myself represent the Soils Department which In turn represents the Research Division and Extension.

I should also mention Jim Bockheim, whom some of you know, who is in Forest Soils in the Soils Department and who is a part of our pedology group.

The Soils Department has been the "active" cooperator with SCS for many years and the Research Division is credited as such on Memos of Understanding and on soil survey reports. I review Memo's for our Director and maintain a file. I also participate in some reviews, as do other members of our group. We also maintain a correlation file, review soil survey reports, and carry out other tasks associated with this cooperative effort. All of us involved in the cooperative soil survey, even peripherally, meet from two to four times a year and discuss progress, problems, cooperative efforts, etc.

With respect to specific contributions of our group, Jerry Tyler's primary responsibilities are administration and research related to small scale waste disposal of household wastes. His research at present includes determination of soil potential in respect to disposal systems. In other words, determining the types of disposal system needed on various lands, and building that cost into the overall value of the lot. Another research area concerns soil absorption systems for community wastewater disposal. A number of villages in Wisconsin are using or are interested in using these systems. Problems such as the mounding of water beneath the systems are being investigated. He is also involved in investigations regarding the use of computer-aided systems for soil protection of wastewaters. This study is being done with a number of cooperators including investigators supported by SWAMP-UW Madison. UW Stevens Point, and others.

I should also mention that Jerry has been very helpful to me over the years in that he has been very willing to help teach certain portions of Soils 315 (Soil and Land Use Planning). This is a large enrollment class of mainly non-soils students whom we hope to teach enough about soils so that they will recognize a soils problem when they see it, and call upon a soil scientist for help. This year we used computers in the classroom for the first time, to try and show them how computers could be helpful in solving problems'related to soils. Jerry played a vital role in that exercise.

Fred Madison has also done considerable research relating to the protection of groundwater by soil. This is shown by his work on the White Clay Lake project, with manure pits in various parts of the state, and more recently his leadership in preparation of county maps by the Geological Survey which show soil associations, rated according to their predicted capacity for attenuation of contaminants. In addition, he does a variety of other kinds of Extension and research, including a joint project with myself and a geologist, in which a peat inventory was made of the state. Recently Fred was overseas in the Gambia and has since had a research project approved that would bring together data on Gambian soils.

He also coaches the Soil Judging team and currently assists in the teaching of Soils 230, a general course about soils for nonscience majors.

Kevin is the newest member of our group. One of his research projects at present is a study of soil microfabric and soil physical properties under several different tillage systems, and the effect of these on soil water movement and other soil properties. Host of this work is being done on soils at our Experimental Farm at Arlington, however, he plans to broaden the geographical scope of the study to include other kinds of soils.

Another study relates to the genesis of a high bulk density layer in North Central Wisconsin soils. This is presently being done on Freon and Freer soils in Taylor County. The hydrologic regime of these soils is also being monitored and the relation of these factors to forest productivity studled. Fred Madison is a cooperator on this project as are several faculty members from UW River Falls.

In addition to these and several other research projects getting underway, Kevin will be teaching Soils 325, Soil Morphology, Classification and Genesis, this fall. This is the course that I formerly taught, and is one of the primary courses in both our undergraduate and graduate curricula.

I have several projects going. One involves a soil-crop yield study that I have worked on for several Years. Both traditional yields as obtained from farmers and researchers, and yields arrived at by computer assisted calculations, based on soil characteristics, are being used. This is a cooperative University - SCS project and will be published by Extension.

We also have a cooperative project, in which we are doing extension work with rural assessors, teaching them how to use soils information in their work. This has been very Well received. We hold two meetings a year, each for 100 participants. If our tax laws are changed so that farms are assessed according to their agricultural value, this program will be extremely popular and useful, University Extension - Madison, Stevens Point, SCS, DOR and private assessors are involved.

Our Histosol research is continuing. The present emphasis is on better characterization of the most decomposed of sapric soils, those that we believe constitute a separate suborder in the present system.

Another study I should mention is research in the area of remote sensing. Recent satellite images were manipulated in such a way as to remove the effect of vegetation. The result is a color map on which we can differentiate soils using such criteria as textural character, natural drainage and color (O.M.). It will also differentiate alluvial-colluvial soils from those formed in-situ. This research is very interesting in several ways. For example the map shows rather clearly, how complex the soil pattern in an alluvial area can be.

Finally, I should mention that the University of Wisconsin-Madison is but one of four schools in Wisconsin that prepares and trains soil scientists. Universities at River Falls, Platteville and Stevens Point are also very active in this field.

SOIL SURVEY IN WISCONSIN - 1986

1. A report on counties surveyed and numbers of soil scientists is given on a separate sheet.

2. University of Wisconsin research end Extension in support of the soil survey program.

   A number of programs are underway. They are listed, in no particular order, as follows:

   a. A soil-crop yield study has been underway for two years. Both traditional yields based on field experience and research data, and yields based on computer analysis of soil characteristics are being used. University - SCS cooperation. To be published by Extension.

   b. A soil-forest productivity project is also underway. Cooperation between U.W., DNR and SCS.

   c. Rural appraisal of farm lands is the subject of another cooperative project. Involved are meetings with assessors from various parts of the state. UW Stevens Point, UW Madison, SCS, DOR and private assessors.

   d. A study of soil microfabric and soil physical properties under several different tillage systems is underway at the Arlington Experiment Station, UW Madison.

   e. A study of the genesis of a high bulk density layer in soils of North Central Wisconsin is underway. The hydrologis regime of these soils is also being characterized as are the relation of these factors to forest productivity. UW Madison, UW River Falls.

   f. Histosol research is continuing. Present studies concentrate on characteristics that identify strongly degraded (<7% fiber) soils. UW Madison

   g. A further study is being done in the area of remote sensing and soil delineation. Preliminary results indicate that alluvial, terrace, and organic soils can be differentiated. U.W. Madison Departments of Soils and Environmental Monitoring.

   h. Gambian project. Basic characterization data on Gambian soils is being entered into a computer to make it available and usable. UW Madison.

   i. Several projects involving small scale waste disposal are underway. UW Madison.

North Central Soil Survey Conference
Columbus, Ohio
June 16-20, 1986

FIELD ACTIVITIES

Typical Ohio weather provlded the setting for a very pleasant and Informative field trip in east-central Ohio.

The fleld trlp offered an opportunity to study soils, geomorphology, agricultural research, no-till farming and other soil and water conservation practices, and enjoy Ohio Indian culture of the Flint Ridge State Memorial Park..

Individuals providing a lead role on the field trip were Ed Redmond, Area Soil Scientist, Bob Parkinson, Muskingum County Project Soil Survey, Roy Adomskl, District Conservationist in Knox County, Neal Springer, no-till farmer and Bill Edwards, Soil Scientist at ARS Hydrologic Statlon - Coshocton, Ohio.

Soils of the Centerburg series, fine-loamy, mixed, mesic Aquic Hapludolls; Homewood series, fine-loamy, mixed Typic Fragludalfs; Keene serles; fine-silty mixed, mesic Aqulc Hapludalfs and Alford serles. fine-silty, mixed, mesic Typic Hapludalfs were observed and studied in well prepared pits on observation areas of roads.

The tour and explanation of the history and accomplishments of the ARS Hydrologic Station at Coshocton were most informative and Interesting.

Especially impressive were the long term records and studies being conducted on the lysimeter. The tour of the Flint Ridge State Memorial and the souvenir tokens are appreciated. Special note is expressed to Ed Redmond, Area Soil Scientist, for his high energy level and most informative discussion related to soils and their Interpretation at each scheduled field stop.

North Central Soil Survey Conference
of the National Cooperative Soil Survey
June 16-20, 1986
Columbus, Ohio

Committee 1 Report

Development and Coordination of Soil Survey Data Bases

Tht North Central Soil Survey Confertnct reviewed the committee 1 report and made the following recommendations at the business meeting at the tnd of the session.

1. Committee 1, Development and Coordination of Soil Survey Data Banes will be retained.

2. Charge 1, "Provide listings of state and federal data bates containing soil survey information which art available, under development, or anticipated" and Charge 3, "develop a list of computer programs which have been developed or trt under devtlopment to aid soil survey activities" will be sent to the National Work Planning Conference with the recommendation that these charges bt considered as charges for the upcoming National Work Planning Conftrtnct.

3. The listing of data bases, files, and routines listed undtr charge 1 and charge 3 will be sent to the wholt membership of the Midwest Soil Survey Committee immediately.

4. Charges 1 and 3 will be retained as charges for the next North Central Soil Survey Conference.

5. Charge 2, "Develop a procedure to promote tht coordination of concepts and terminology among the various data bases" was considered to be a good idta but implementation could be difficult. In view of this, no recommendation was made.

6. Charge 4, "Identify potential users for soil survey data bases" did not generate a great deal of response and no recommendations were made.

7. Charge 5, "Review the recommendations of the soil survey software development team" was not considered because the recommendations were not • vailablt to tht conftrtnce.

__Charge 1__: Provide listings of state and ftdertl data bases containing soil survey information which are available, under development, or anticipated.

__Background__: The intent was to list the kinds of soils reltttd data bases and files used by the member states of the North Central Soil Survty Conference. The list is not complete for the region but covers the information submitted by the committee members. There it tome overlap between charge 1 and charge 3 which was to dtvtlop a list of soil related computer programs used in this region.

The responses to this charge are divided into two parts: Part A Is for general soils related data **bases** and files. Part B Is for 8011 map **digitizing** data bases or files.

A. General soil related data bases and files

1.

Iowa Soil Properties and Interpretative **Data** Base (ISPAID).

DESCRIPTION: This data base provides a comprehensive file **of soil** properties and interpretations at the Boll map unit level for Iowa **soils.** The file now contains approximately 1900 lines of **soil** map units for 77 Iowa Counties. When completed, this data base will include Information for all map units in all 99 of Iowa's counties. **This** is an open-ended data base and now **has** 60 fields of data for each **soil** map unit. Current data can be updated or new interpretations can be added to the soil map units as knowledge evolves in the future. One field contains the acreage **of** each soil map unit. This provides a basis for summarizing soil properties on a county-by-county or major **soil** association area, or major land resource **area** in Iowa. The data **base is used to** generate **tables for** interim soil survey reports, The data base lists **tillage** ratings, crop yields and organic matter levels that have been adopted by the Soil Conservation Service. It was used to develop lists of prime farmland for each county **as** required **by** the Farmland Protection Act. The data base **is** also used to annually update the checklist of soil **properties in ongoing soil surveys.** The **checklist is** used in writing the **soil** survey manuscript.

PROGRAM INFORMATION: The data dictionary **is available** from the contact person.

HARDWARE INFORMATION: The hardware **is** an IBM PC AT with a 20 **MB** hard disk and the MS/DOS operating **system.** It can be downloaded to other compatible **PC's.** It Is also on the AT&T **3B2** with a 20 **MB** hard disk and the **UNIX** operating system.

AVAILABILITY OF THE DATA: Limited access but more Information can be gotten from the contact person.

CONTACT PERSON: Gerald A. Miller
Professor and **Extension Agronomist**
Iowa State University
117 Agronomy Building
Ames, IA **50011**
Phone 515-294-1923

2.

NAME: Soil DBMS

DESCRIPTION: The Soil Survey Data Base Management System displays 7.5 minute quad sheets or township sheets of the same data base. The **system** is menu driven and user friendly. It provides options to window and Boom on selected areas, to point sorted Boll attributes, to Bave and print displayed screen images, to overlay multiple maps, to input and modify data base data, and reformat 9-track magnetic tape data using the SCS geographic exchange format to an IBM/PC disk format.

PROGRAM INFORMATION: Home graphics system and METAFILE DBMS.

HARDWARE INFORMATION: IBM PC XT/AT, 512K RAM, 20 MB hard disks, ARTIST 1 graphics controller, and high resolution graphic monitor (1024x 1024 PELS or equivalent).

AVAILABILITY OF THE DATA: In development and avaiable in the summer of 1986 from the contact person.

CONTACT PERSON: Pierre Robert
University of Minnesota
Department of Soil Science
1991 Upper Burford Circle
St. Paul, MN 55108
Phone 612-376-9183

3.

NAME: North Dakota Soil Lab Data

DESCRIPTION: About two-thirds of all the physical and chemical soils data from North Dakota is in the data base. The data is from samples run in the laboratory at North Dakota State University, the Soil Conservation Service, and the Bureau of Reclamation. The series descriptions for the sampled soils are not in the data base at this time.

PROGRAM INFORMATION: The data set and data dictionary are under development. The data is on a relational data base called KNOWLEDGE MAN.

HARDWARE INFORMATION: The hardware is Zenith, that is IBM/PC XT compatible. It has an MS/DOS operating system and 640K RAM memory.

AVAILABILITY OF THE DATA: From the contact person.

CONTACT PERSON: Donald D. Patterson
Soils Department
North Dakota University
Fargo, ND 58102
Phone 701-237-8950

4.

NAME: Ohio Capability Analysis Program

DESCRIPTION: This data base contains digitized soil maps for about 44 of Ohio's 88 counties plus portions of some other counties which were involved in some type of special study. It also contains all the information stored on the SCS-SOI-5 forms for soils in Ohio as well as information pertaining to ground water resources, landownership, land use, transportation corridors, geology, and utility networks. It is designed to provide information to local units of government that is useful in land use planning.

PROGRAM INFORMATION: Software used to store and access the data set WAS developed on contract with ODNR by the Ohio State University. A users manual for the system is available from the contact person.

HARDWARE INFORMATION: The data set is stored on the Ohio Data Users Network on an IBM 3083 mainframe computer.

AVAILABILITY OF THE DATA: This data set is currently accessible only by personnel from the ODNR/DSWC in the Ohio Capability Analysis Program. An effort is being made to make the system accessible to remote locations via modem.

CONTACT PERSON: David Crecelius
Ohio Capability Analysis Program
ODNR-Division of Soil and Water Conservation
Fountain Square, Building E
Columbus, OH 43224
Phone 614-265-6776

5.

NAME: Ohio Characterization Data

DESCRIPTION: This data set include8 physical, chemical, and mineralogical data on soil samples that have been gathered during progressive soil surveys, graduate research projects, and special studies conducted throughout the state. It is designed to support the classification of soil8 in Ohio and provide data on which to base interpretations in the state.

PROGRAM INFORMATION: The software used to store and access the data set was developed at the Ohio State University.

HARDWARE INFORMATION: Portions of the data are stored on DEC mainframe computer at the Ohio State University Computer Center and parts are stored on IBM/PC floppy disks at the Department of Agronomy at Ohio State University.

AVAILABILITY OF THE DATA: Availability is limited but information can be gotten from the contact person.

CONTACT PERSON: Neil Smeck, Professor
OSU-Department of Agronomy
2021 Coffee Road
Columbus, OH 43210
Phone 614-422-2002

6.

NAME: Soil Interpretations Record (SCS-SOI-5 date)

DESCRIPTION: The data base contains estimated soil properties and interpretive data for all soil series in the United States.

PROGRAM INFORMATION: The program language is PL/1.

HARDWARE INFORMATION: The hardware is a National Advanced System, model AS/9160, running under an IBM MVS/SP system. It is located at the Iowa State University Statistical Laboratory in Ames, Iowa.

AVAILABILITY OF THE DATA: The data is available vith either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: Harvey Terpstra
Iowa State University
Statistical Laboratory
212 Snedcor Hall
Ames, Iowa 50011
Phone 515-294-8177

7.

NAME: Map Unit Use File (MUUF)

DESCRIPTION: The data base contains the SCS-SOI-6 forms for all of the correlated and some of the uncorrelated map units in the United States, About 2,000 survey areas are in the file.

PROGRAM INFORMATION: The program language is PL/1.

HARDWARE INFORMATION: The hardware is a National Advanced System, model AS/9160, running under an IBM MVS/SP system. It is located at the Iowa State University Statistical Laboratory in Ames, Iowa.

AVAILABILITY OF THE DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: Harvey Terpstra
Iowa State University
Statistical Laboratory
212 Snedcor Ball
Ames, Iowa 50011
Phone 515-294-8177

8.

NAME: Soil Classification File

DESCRIPTION: The file is the official listing of soil series, their classification, and the state responsible for the series.

PROGRAM INFORMATION: The program language is PL/1.

HARDWARE INFORMATION: The hardware is a Rational Advanced System, model AS/9160, running under an IBM MVS/SP system. It is located at the Iowa State University Statistical Laboratory in Ames, Iowa.

AVAILABILITY OF THE DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: Harvey Terpstra
Iowa State University
Statistical Laboratory
232 Snedcor Ball
Ames, IA 50011
Phone 515-294-8177

9.

NAME: Official Soil Series Description File (OSED)

DESCRIPTION: The data base is the depository for official soil series descriptions. It consists of eight separate files; a master file and a monthly file for each of the four NTC regions. Series descriptions are continually being added or revised and these descriptions are entered into the respective monthly file. At the first of the month the contents of the monthly file is moved to the master file. The user can retrieve lists containing all of the series names in a file or lists of series names by user states from any one of the eight files. The user can also retrieve one or more series descriptions from any of the files or all of the series descriptions for a state from any one of the files.

PROGRAM INFORMATION: The program language is FORTRAN and COBAL.

HARDWARE INFORMATION: The hardware is IBM 370 system compatible and has a variety of communication services. It is located at the USDA Washington Computer Center in Washington, D.C.

AVAILABILITY OF THE DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: R. H. Griffin, II or Joe Hurst
USDA, Soil Conservation Service
South National Technical Center
501 Felix Street, FWFC, Bldg. 23
P.O. Box 6567
Fort Worth, TX 76115
Phone 817-334-5231

10.

NAME: USDA-Soil-Crop Yield Data (CRYPL)

DESCRIPTION: The data base consists of crop yields, soil phases, management practices, and location and size of plot.

PROGRAM INFORMATION: The program language is FORTRAN.

HARDWARE INFORMATION: The hardware is IBM 370 system compatible and has a variety of communication services. It is located at the USDA Washington Computer Center in Washington, D.C.

AVAILABILITY OF THE DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: R. H. Griffin, II or Joe Hurst
USDA, Soil Conservation Service
South National Technical Center
501 Felix Street, FWFC, Bldg. 23
P.O. Box 6567
Fort Worth, TX 76115
Phone 817-334-5231

11.

NAME: Engineering Test Date (SCS-SOI-10)

DESCRIPTION: The data base consists of engineering laboratory soil test data for about 10,000 pedons. It includes engineering classification, grain size distribution, liquid limit, plasticity index, moisture density, etc. This data base is not operational at this time.

PROGRAM INFORMATION: The program language is FORTRAN.

HARDWARE INFORMATION: The hardware is IBM 370 system compatible and has a variety of communication services. It is located at the USDA Washington Computer Center in Washington, D.C.

AVAILABILITY OF THE DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center,

CONTACT PERSON: R. Ii. Griffin, II or Joe Hurst
USDA, Soil Conservation Service
South National Technical Center
501 Felix Street, FWFC, Bldg. 23
P.O. Box 6567
Fort Worth, TX 76115
Phone 817-334-5231

12.

NAME: 1982 National Resource Inventory (NRI)

DESCRIPTION: The 1982 National Resource Inventory data base contains basic data on the condition of soil, water, and related resources on America's rural, nonfederal land vhere crops are grown, livestock is raised, and forests are grown. The information in the data base was obtained from 350,000 randomly Selected sample points.

PROGRAM INFORMATION: The program language is PL/1.

HARDWARE INFORMATION:
The hardware is IBM 370 system compatible and has a variety of communication services. It is located at the USDA Washington Computer Center in Washington, D.C.

AVAILABILITY OF THE DATA: The data is available as a tape from the contact person. It is also available asynchronously with a menu driven query system at the Washington Computer Center.

CONTACT PERSON: Gary R. Nordstrom, Director
Resource8 Inventory Division
Soil Conservation Service
U.S. Department Of Agriculture
P.O. Box 2890
Washington, DC 20013
Phone 202-447-6267

13.

NAME: Interactive Soils Information System

DESCRIPTION: The data base contains the SCS-SOI-5 soil interpretation records and the SCS-SOI-6 map unit records in the map unit use file for the soils in the United States. The data base was developed jointly by the SCS and the U.S. Army Construction Laboratory (CERL).

PROGRAM INFORMATION: The data base is set up on a UNIX operating system. The programs in the system are essentially menu driven but 8 users manual is necessary. The users manual is currently being updated and will be available from the contact person.

HARDWARE INFORMATION: The hardware is a DEC VAX 11/780 computer with UNIX operating system at the University Of Illinois at Urbana, Illinois.

AVAILABILITY OF THE DATA: The data is available with an asynchronous modem.

CONTACT PERSON: Lynn Engleman
Bureau of Urban and Regional Planning Research
University of Illinois
909 West Nevada
Urbana, IL 61801
Phone 217-333-1369

14.

NAME: National Soil Survey Laboratory Research Data Base

DESCRIPTION: The data base consists of analytical data, pedon descriptions, and site information for more than 12,000 pedons sampled by the SCS laboratories since about 1950. Data collected since 1978 is currently available And the data collected prior to 1978 will be made available as soon as possible. The index of Soil Laboratory Data (SCS-SOI-8) is a related data base and the two data bases are linked.

PROGRAM INFORMATION: The program language is FORTRAN.

HARDWARE INFORMATION: The hardware is an IBM 370 operating system under CMS in Lincoln, Nebraska.

AVAILABILITY OF THE DATA: The data base is on line and can be accessed asynchronously. The contact person has information about the procedure.

CONTACT PERSON: Benny R. Brasher
National Soil Survey Laboratory
Midwest National Technical Center
Federal Building, Room 345
100 Centennial Mall North
Lincoln, NE 68508-3866
Phone 402-471-5363

15.

NAME: Index of Soil Laboratory Data (SCS-SOI-8)

DESCRIPTION: The data consists of the name, location, classification, and kinds of analysis made for each pedon in the National Soil Survey Laboratory Research Data Base.

PROGRAM INFORMATION: The program language is FORTRAN.

HARDWARE INFORMATION: The hardware is an IBM 370 operating system under CMS in Lincoln, Nebraska.

AVAILABILITY OF THE DATA: The access procedure is being developed. It will be asynchronous and the contact person has information about the procedure.

CONTACT PERSON: Benny R. Brasher
National Soil Survey Laboratory
Midwest National Technical Center
Federal Building, Room 345
100 Centennial Mall North
Lincoln, NE 68508-3866
Phone 402-471-5363

16.

NAME: Heavy Metal Data

DESCRIPTION: The data consists of 300 samples analyzed for cadmium, lead, nickel, zinc, and copper. The sampling was done in a period of time starting in 1979 through 1982.

PROGRAM INFORMATION: The program was written in SAS.

HARDWARE INFORMATION: The hardware is an IBM 370 operating system under CMS in Lincoln, Nebraska.

AVAILABILITY OF THE DATA: The data base is available through the contact person.

CONTACT PERSON: George Holmgren
National Soil Survey Laboratory
Midwest National Technical Center
Federal Building, Room 345
100 Centennial Mall North
Lincoln, NE 68508-3866
Phone 402-471-5363

17.

NAME: Soil Water Retention Data Use System

DESCRIPTION: The data consists of 19,200 sets of parameters which are used to calculate water retention curves.

PROGRAM INFORMATION:

HARDWARE INFORMATION: The hardware is en IBM 370 operating system under CMS in Lincoln, Nebraska.

AVAILABILITY OF THE DATA: Access to the data base is available through the contact person.

CONTACT PERSON: Otto W. Baumer
National Soil Survey Laboratory
Midwest National Technical Center
Federal Building, Room 345
100 Centennial Mall North
Lincoln, BE 68508-3866
Phone 402-471-5363

18.

NAME: State Soil Survey Data Base

DESCRIPTION: The data base will be developed **as** one of three data bases in the **state's** Computer Assisted Management and Planning System. The data base will contain the data in the manuscript tables for all of the modern soil surveys within the state. The manuscript tables contain data from the **SCS-SOI-5** and the **SCS-SOI-6** forms plus additional data. This is a relational data base and is the state counterpart of the National Soil Survey Area Data Base.

PROGRAM INFORMATION: The date will be on a relational data base, Prelude, and **requires** a UNIX operating system.

HARDWARE **INFORMATION:** The state office will most likely use the AT&T personal computer 6300 with **a** UNIX operating system but any brand of personal computer with **a** UNIX operating system should work.

AVAILABILITY OF THE DATA: Through the contact person.

CONTACT PERSON: The state soil scientist.

19.

NAME: National Soil Survey Area Data Bane

DESCRIPTION: The data base contains the data in the manuscript tables generated for most of the completed modem soil surveys in the nation. The manuscript tables contain data from the SCS-Sol-5 and the **SCS-SOI-6** forma plus additional data. This is **a hierarchical** data base and is the national counterpart of the State Soil Survey Data Base.

PROGRAM INFORMATION: The data is on a SYSTEM 2000 **data base.**

HARDWARE INFORMATION: **The hardware is a Sperry Univac** Model **1100/84** computer located at the USDA Fort Collins Computer Center in Fort Collins, Colorado.

AVAILABILITY OF **THE** DATA: The data is available with either an asynchronous or a bisynchronous modem to users with access to the computer center. The data base is stored on tape and put on line Tuesday through Thursday of each week.

CONTACT PERSON: Wayne R. Larsen
USDA, Soil Conservation Service
P.O. Box 1396
Fort Collins, CO 80522
Phone 303-224-1316

20.

NAME: SCS-SOI-5

DESCRIPTION: The SCS-SOI-5 data is put on A hiararchical data base. The data base is updated periodically from the SCS-SOI-5 information at Ames, Iowa.

PROGRAM INFORMATION: The data is on a SYSTEM 2000 data base.

HARDWARE INFORMATION: The hardware is A Sperry Univac Model 1100/84 computer located at the USDA Fort Collins Computer Center in Fort Collins, Colorado.

AVAILABILITY OF THE DATA: The data is available with either an Asynchronous or a bisynchronous modem to user8 with access to the computer center. The data base is stored on tape and presently is put on line Tuesday through Thursday of each week.

CONTACT PERSON: Wayne R. Larsen
USDA, Soil Conservation Service
P.O. Box 1396
Fort Collins, CO 80522
Phone 303-224-1316

21.

NAME: Plants

DESCRIPTION: The data base presently contains the plant symbol, common name, scientific name, and distribution by states of the plants used in the SCS-SOI-5 data base.

PROGRAM INFORMATION: The data is on a SYSTEM 2000 data base. The schema is available from the contact person.

HARDWARE INFORMATION: The hardware is a Sperry Univac Model 1100/84 computer located at the USDA Fort Collins Computer Center in Fort Collins, Colorado.

AVAILABILITY OF THE DATA: The data is available vith either an asynchronous or a bisynchronous modem to users with access to the computer center.

CONTACT PERSON: Wayne R. Larsen
USDA, Soil Conservation Service
P.O. Box 1396
Fort Collins, CO 80522
Phone 303-224-1316

B. Soil map digitizing data bases and files.

1.

Soil Maps Digitized by the Soil Conservation Service.

DESCRIPTION: Soil maps digitized by the Soil conservation Service or digitizing contracted by the Soil Conservation Service is done using a polygon system and orthphotoquad base maps. Moat maps are 1:24,000 but 1:20,000 or 1:12,000 orthphotoquad maps are also digitized.

PROGRAM AND HARDWARE INFORMATION: The data is plotted and keyed by the Soil Conservation Service with equipment from the Computer Vision Corporation. The digitized data is stored in Standard SCS Exchange Format. The digitizing that is contracted does not specify a particular brand of equipment but does specify the data must be stored in the Standard SCS Exchange Format. The specifications for the Standard SCS Exchange Format are available from the SCS contact person.

AVAILABILITY OF THE DATA: The data is stored on tape and the contact person will assist in obtaining the data.

CONTACT PERSON: George M. Rohaley
National Cartographic Coordinator
Soil Conservation Service
P.O. Box 2890
Washington, DC 20013
Phone 202-447-5405

2.

Digitized soil maps in Indiana.

DESCRIPTION: Purdue University has developed a program for digitizing soil maps using a 1.33 acre cell. The soil maps are not orthophotoquads. In addition to soils data, land ownership is also digitized. The digitizing is done by the Extension Service in the individual counties. The digitizing program has been delivered to 33 Indiana Counties; about 17 of the counties have completed the soil map portion of the digitizing and a smaller number have completed the ownership digitizing.

PROGRAM INFORMATION: The digitizing is done using a map reader board with 480 cells per section which was developed at Purdue University. The data entry program is written in MULTIUSER BASIC. The program currently is designed for the DEC microcomputer. Indiana plans to modify the programs so it will run on the AT&T 3B2/300 or 400 microcomputer with a UNIX operating system. User guides can be purchased from Purdue University.

AVAILABILITY OF THE DATA: The digitized information is stored on diskettes in the county extension offices.

CONTACT PERSON: Joseph Yahner
Professor of Agronomy
Lily Hall
Purdue University
West Layfayette, IN 47907
Phone 317-494-8049

3.

Digitized soil maps in Iowa.

NAME: Multiscale Data Analysis and Mapping Project (MSDAMP)

DESCRIPTION: Iowa State University Land Use Analysis Laboratory has digitized all soil maps in 12 Iowa counties. A latitude-longitudinal geographic base is used to manually encode Boils data. This system results in each cell being 0.17 to 0.18 acre in size. Soils maps of 1:15,840 scale are used as the base map. A series of overlays also are encoded into the data base. These overlays include land ownership data, cultural features, water features to include crossable and noncrossable drainageways, and special soil conditions. In some counties special overlays for elevation contours derived from USGS 7.5 minute topographic maps were prepared as well as overlays delineating current land use. The data is used primarily by the respective county assessor.

PROGRAM INFORMATION: The digitizing is done using a grid overlay and the information is entered on a microcomputer and uploaded to a mainframe.

HARDWARE INFORMATION: The hardware is an IBM PC AT with a 20 MB hard disk and the MS/DOS operating system. It can be downloaded to other compatible PC's. It is also on the AT&T 3B2 with a 20 MB hard disk and the UNIX operating system.

AVAILABILITY OF THE DATA: The data is available primarily on tape.

CONTACT PERSON: Thomas E. Fenton
Professor of Agronomy
Department of Agronomy
Iowa State University
Ames, IA 50011
Phone 515-294-2414

4.

Digitized soil maps in Kansas.

DESCRIPTION: The digitizing in Kansan has been done by the Soil Conservation Service. Two counties were done with the line segment method and four counties using lo-acre cells.

PROGRAM INFORMATION: The digitizing was done some time ago and the exact methods used are not available.

AVAILABILITY OF THE DATA: From the contact person.

CONTACT PERSON: George M. Rohaley
National Cartographic Coordinator
Soil Conservation Service
P.O. Box 2890
Washington, DC 20013
Phone 202-447-5405

5.

Digitized soil maps in Michigan.

DESCRIPTION: The Michigan Department of Natural Resources is responsible for a statewide geographic information system. In this program the topography maps, soil maps, and other kinds of information are digitized. The plan is to digitize the whole state and Michigan is working on the third county soil survey. Michigan is digitizing lines on the maps. The topography maps are a controlled base and the soil map8 are the ordinary rectified maps. Michigan has developed a detail list of instructions for the personnel doing the digitizing in order to achieve an acceptable match between the controlled based topography maps and the soil maps.

PROGRAM AND HARDWARE INFORMATION: Two digitizing systems are used. The larger one is an Intergraph System plotter with six work stations and the data is stored on a VAX 11/785 mainframe computer. The Michigan Department of Resources has also developed a microbased digitizing package called CMAP which requires a personal computer with an MS/DOS operating system. The date gathered with the personal computer is periodically transmitted to the main data base on the VAX 11/785 mainframe computer.

AVAILABILITY OF THE DATA:

CONTACT PERSON: Michael Scieseka
Department of Natural Resources
Land Resource Program
Steven T. Mason Building
P.O. Box 30028
Lansing, MI 48909
Phone 517-373-1170

6.

Digitized soil maps in Missouri.

DESCRIPTION: Missouri has four counties digitized by the Soil Conservation Service using the polygon system. The base maps are 1:24,000 size orthophotoquad maps. Missouri also has two counties digitized by the Soil Conservation Service using lo-acre cells and ordinary rectified soil maps. They also have one survey digitized by the University of Missouri using a digital image scanning technique and 1:20,000 ordinary rectified soil maps. Work has started on another county using the digital scanning technique but using 1:20,000 orthophotoquad base maps. The digitizing done by the University of Missouri is ordinated using the Universal Transverse Mercator System rather than the latitude and longitude system.

AVAILABILITY OF THE DATA: The Soil Conservation Service digitized data is available from George M. Rohaley and the other data is available from Dr. McFarland.

CONTACT PERSON: William McFarland, Professor
Building 303, Electrical Engineering
University of Missouri
Columbia, MO 65211
Phone 314-882-3078

George M. Rohaley
National Cartographic Coordinator
Soil Conservation Service
P.O. Box 2890
Washington, DC 20013
Phone 202-447-5405

7.

Digitized soil maps in Minnesota.

NAME: Soil Survey Digitization and Data Entry Softvare

DESCRIPTION: The University of Minnesota has digitized the soil maps for 10 Minnesota counties. A line point polygon system is used and the base maps are not orthophotoquads. The digitized data is used in Minnesota'8 SOIL DBMS and County Soil Survey Information System data bases.

PROGRAM INFORMATION: The digitizing is done with photoacan equipment attached to an IBM/PC AT. The data from one township is put on one floppy disk.

HARDWARE INFORMATION: The hardware is an IBM/PC AT.

AVAILABILITY OF THE DATA: The data is available through the contact person primarily on a floppy disk.

CONTACT PERSON: Pierre Robert
University of Minnesota
Department of Soil Science
1991 Upper Burford Circle
St. Paul, MN 55108
Phone 612-376-9183

8.

Digitized soil maps in Nebraska.

DESCRIPTION: The State of Nebraska Resource Commission has digitized the soil maps in about 50 Nebraska counties. They use 2-acre cells and the maps are not orthophotoquads. The data is used to produce prime farmland maps, interpretative maps, land resource maps, and land resource tables.

PROGRAM INFORMATION: The digitizing is done using a grid overlay and the information is keypunched.

HARDWARE INFORMATION: The data is stored on tape but when used, is **put on IBM 370 MVS** system located in Lincoln, Nebraska.

AVAILABILITY OF TEE DATA: The data is available through the contact person as a tape or with a modem.

CONTACT PERSON: Mahendra Bansal
Head of Natural Resources Data Bank
State House Building
P.O. Box 94876
Lincoln, NE 68508-3866
Phone 402-471-2081

9.

NAME: Digitized Soil Haps in North Dakota

DESCRIPTION: Map digitizing in North Dakota is done in selected areas. Areas range from less than a section to many sections in size. One of the important uses is to establish parameters for computerized fertilizer application. The digitizing is done by North Dakota State University from ordinary rectified soil maps and using a line point polygon system.

EQUIPMENT AND TECHNIQUE: The digitizing is done with photoscan equipment attached to IBM/PC. The data is stored on a floppy disk.

AVAILABILITY OF THE DATA: From the contact person.

CONTACT PERSON: Ed Vasey
North Dakota State University
Fargo, ND 58105
Phone 701-237-8837

10.

Digitized soil maps in Ohio.

DESCRIPTION: The Ohio Division of Natural Resources-Division of Soil and Water Conservation (ODNR/DSWC) has digitized about 44 counties. The digitizing is done using a cell system. The soil maps are not orthophotoquads. The digitized data is part of the data in the Ohio Capability Analysis Program.

PROGRAM INFORMATION: The digitizing is done with a coordinator graph, keypunched, and stored on a mainframe computer. The data is stored in raster format.

HARDWARE INFORMATION: The data is stored on the Ohio Data User Network IBM 3083 mainframe computer.

AVAILABILITY OF THE DATA: The data is presently accessible only by personnel from ODNR/DSWC in the Ohio Analysis Program. An effort is being made to make the data available by a modem.

CONTACT PERSON: David Crecelius
Ohio Capability Analysis Program
ODNR/Division of Soil and Water Conservation
Fountain Square, Building E
Columbus, OH 43224
Phone 614-265-6776

11.

Digitized soil msps in Wisconsin.

DESCRIPTION: The University of Wisconsin in cooperation with the Soil Conservation Service and Dane County, Wisconsin, is digitizing the Dane county soil maps. They are using the polygon system. The soil maps are not orthophotoqusds.

PROGRAM INFORMATION: The digitizing is being done with a Tslos digitizer and the data is transmitted to the mainframe through a remote terminal. The project software is ODYSSEY.

HARDWARE INFORMATION: The hardware is a VAX 11/780 st the University of Wisconsin.

AVAILABILITY OF THE DATA: Information is available from the contact person.

CONTACT PERSON: Nicholas R. Chrisman, Assistant Professor
14 Agriculture Hall
University of Wisconsin
Madison, WI 53701
Phone 608-263-6507
Phone 608-263-5534.

Charge 2: a procedure to promote the coordination of concepts and terminology among the various data bases.

1. The concepts and terminology used in data dictionaries should be published by organizations concerned with soil related data bases. The publications should have broad review. Organizations which could render this service are the American Society of Agronomy, Soil Science Society of America, Soil Conservation Society of America, American Society of Photogrammetry and Remote Sensing, and the American Congress of Surveying snd Mapping.soil Depping.

Charge 2:

1.

NAME: **Pedon** Description Data Base.

DESCRIPTION: This is a microcomputer program for entering and retrieving **SCS-SOI-232** soil descriptions. The retrieval program output is in two **forms.** One output form is exactly as it was stored with the abbreviated notations for color, texture, structure, and other values. The second output is in the written form used in published **soil** surveys or official series descriptions.

PROGRAM **INFORMATION:** The program was written in BASIC for the MS/DOS operating system and is being rewritten in C language for the UNIX operating system.

HARDWARE INFORMATION: Most personal computers.

AVAILABILITY OF THE DATA: The National Soil Survey Laboratory or the contact person.

CONTACT PERSON: Maurice Hausbach
Soil Interpretation Specialist
USEA/SCS, P.O. Box 2890
Washington, DC 20013
Phone **202-382-1811**

2.

NAME: County Soil Survey Information System **(SSIS)**

DESCRIPTION: The system uses multilevel menus to access, process, and display soil survey maps and data. The interpretative maps are displayed one section at a time on the graphic monitor. Simultaneously menu, text, or tabular data are shown on the monochrome display. A selected soil characteristic or interpretation can be highlighted and its acreage computed. Maps, texts, and tables can be printed.

PROGRAM INFORMATION: Home system.

DESCRIPTION: IBM PC XT/AT and truly compatible equipment of other makes. 256K RAM, monochrome adaptor and monitor, graphics adaptor, and monitor.

AVAILABILITY OF THE DATA: Available from the contact person.

CONTACT PERSON: Pierre Robert
University of Minnesota
Department of Soil Science
1991 Upper Burford Circle
St. Paul, MN 55108
Phone 612-376-9183

3.

NAME: Suboption of WBEATPACK

DESCRIPTION: This is an education demonstrational packet. It is based on soil factors and available water capacity and is used for yield predictions of selected crops by map units.

PROGRAM INFORHATIOA: The program is written in IBM BASIC.

HARDWARE INFORMATION: IBM/PC or IBM compatible PC with 256K RAM and on MS/DOS operating system.

AVAILABILITY OF THE DATA: From the contact person.

CONTACT PERSON: Ed Vasey
North Dakota State University
Fargo, ND 58105
Phone 701-237-8837

4.

NAME: Soil Map Unit Analyzer

DESCRIPTION: A program to analyze field notes to determine proper naming of map units.

PROGRAM INFORMATION: A Users Manual is available from the contact person.

HARDWARE INFORMATION: The program can be purchased for use on the IBM/PC or PC Jr., Apple II, II+, IIc, IIe, III or McIntosh, HP-150, NEC-8201A, or Radio Shack 100.

CONTACT PERSON: Pedologues, Inc.
P.O. Box 761
Auburn, AL 36831-0761

5.

BAKE: Scheduling of Map Finishing Projects

DESCRIPTION: This procedure is used to schedule map finishing activities in the Missouri map finishing shop. The procedure requires the entering of dates, man-hours spent on various phases of map finishing, and time needed to complete the project. The procedure can be used to schedule more than one project or can be used to compute man-hours needed to finish a job vithin a given period of time.

PROGRAM AND HARDWARE INFORMATION: The hardware is a TI-59 programable calculator and printer. Cards are needed to read in the data.

NORTH CENTRAL SOIL SURVEY CONFERENCE

MEMBERSHIP LIST FOR COMMITTEE 1

Development and Coordination of Soil Survey Data Bases

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Salina, KS 67401

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Biamarck, ND 56502

North Central Soil Survey Conference
June 16-20, 1986
Columbus, Ohio

Committee 2 Report

Soil Interpretations

Committee Members	Present at Meeting
Gary D. Lemme (Chairman)	yes
Bill Broderson (Vice-Chairman)	yes
Frank L. Anderson	yes
John R. Nixon	yes
Keith K. Huffman	yes
Marvin L. Dixon	no
Loren Berndt	no
Jerry Larson	no
Richard Bond	no
Carl Tretten	no
Edward L. Fleming	no
Miles W. Smalley	no
Larry Ragon	no
Paul R. Johnson	no

Interested Individuals Participating

Norm Helzer
Bill Roth
Larry Zavesky
Sam Orr
Earl Voss
Rex Mapes
Lee Sikes
Bill Pauls
Cornelius Heidt
Earl Lockridge
Hill Frederick
Stephen Shetron
Jim Crum
Pat Merchant
Douglas Oelmann

Charge 1: How can the reliability of data placed on SOI-5 files be verified? Should statistical parameters be incorporated so that users wi 11 have some way to gage confidence 1 imits?

Nearly everyone supported the concept that. actual data should be used whenever possible and that we need to continue to collect reliable laboratory data. Soil series that occur in more than one state could prove to be valuable sources of information concerning the range of characteristics in laboratory determined properties. Several members indicated that cross checking of National Soil Survey Laboratory (NSSL) data, along with university data., should improve our understanding of the information found on the SOI-5 files. Development of the National Soil Survey characterization data file should aid in these efforts in the future. In addition, it was recognized by the committee that data verification is an on-going duty of all users of the SOI-5 files.

The committee did not support the establishment of statistical parameters or- confidence limits surrounding the data found on the SOI-5 files. Most member-s indicated that it would be difficult to statistically verify the SOI-5 file data. In fact, one member pointed out that "considering the way the SOI-5 data is of ten used, statistical reliability is not a concern." Generally persons asking for such data are scientists not involved in gathering soils information.

A. Recommend that statistical parameters not be placed on SOI-5 file records.

B. Recommend that NCSS members share data and methods used in developing interpretation ratings with other user groups to improve understanding of SOI-5 information by all users.

Charge 2: Where hard data do not exist. how should estimated soil. be suppies orted?

The committee supports the on-going soil characterization efforts of the National Cooperative Soil Survey to broaden the database available to users and soil scientists. When hard data is not available, similar soils that have been characterized can provide the information necessary to complete the SOI-5 files. The term "estimated properties" is confusing to some users. However, identifying data sources on which SOI-5 entries at-e estimated or based on hard data will not relieve the problem for most of these users.

A. Recommend that footnotes identifying the data sources of SOI-5 information not be required. However , SO1-5 authors should be given the option of identifying hard data sources of those when desired.

Charge 3: Are the procedures for revising data on the SOI-5's satisfactory?

The established procedures for revising the SOI-5's seems to be acceptable to everyone concerned. However, the group was concerned with thr time lag presently associated with the revision process.. The implementation of computer input. equipment at the various state off ices should improve the turnaround time and omission problems currently associated with the revision procedure. However, states should not. have the flexibility to make changes in data files until approval has been obtained from all states and TSC's involved.

A. Recommend that regional control of the SOI-5 files be continued to insure file uniformity.

B. Recommend that all cooperating agencies be provided with copies of updated SOI-5 files as updates occur.

Charge 4: Examine successes or problems encountered with the soil-crop yield database program.

The committee WAS less united on this charge than the other three. Most members felt that the concept of collecting actual crop yields for various soil map units was good. However, most members have experienced a variety of problems with the program. SCS-SOILS-1 forms would be easier to fill out if the form was expanded. Handling of missing values as zeros in the forms has serious ramifications that need to be addressed immediately by the national program coordinator.

The perceived importance of the program by state and federal personnel seems to vary greatly. As a result, some committee members have found it difficult to get someone to collect the data on a regular basis during the current. year and during up-coming years. If the project was perceived to be important by all involved, the commitment to collecting data would take care of itself. The committee agreed that SOI-1 forms are not easy to edit and some additional data columns , such as plant population or- pounds/acre seeded, rainfall data recorded with one tenth inch precision, and a comment section to explain unusually high or low yields, be considered for addition.

A. Recommend that.. revisions suggested for the 501-i form be considered.

B. Recommend that the soil 'crop yield database program be continued.

North Central Soil Survey Conference
June 16-20, 1986
Columbus, Ohio

Committee 3 Report

Soil-Water Relationships

This Committee was formed to consider the four charges listed below.

1. Evaluate the new classes for hydraulic conductivity given in the National Soils Handbook.

2. Consider improvements in the definition of moisture control section.

3. Evaluate the desirability of requiring measured or estimated soil moisture data for determining soil moisture regime instead of climatic data.

4. Consider the advisability and utility of the development of regional water information records (generalization of information available for a given region). Types of information which could be considered include: Infiltration rates, water desorption curves, water regimes, and runoff.

These charges were sent to the Committee members for their response. The individual responses were summarieed for discussion by the Committee from 0800-1000 on Tuesday, June 17, 1986 in Room 103 Kottman Hall, Ohio State University.

Recommendations from the Committee:

Charge 1. The hydraulic conductivity classes are not currently being used, and there appears to be no effort to replace the presently used permeability classes with them. Recommend that: (1) if they are not going to be used, remove them from the Handbook and replace them with the permeability classes that appear to be more useable, or (2) if they are to eventually be used, develop an organized program to gather data that will support them.

Charge The currently used moisture control section appears to be based on the assumption that water moves downward along a uniform wetting front as a soil is moistened. This is not consistent with observed phenomena. In addition, there are few data to support the location of the moisture control section in any particular soil. Moisture Regimes are determined by the length of time the moisture control section is at >1500 kPa moisture stress. Hence, location of this section in a soil is critical to judgment as to its Suborder placement within Mollisols t Alfisols within the region. Recommend: (1) that the moisture control section be evaluated in terms of Its usefulness and (2) that it be defined in terms that it can be identified within a given pedon.

Charge 3. The problems of use of Ustic and Aridic moisture regimes to clasify soils exists only in South Dakota, Nebraska, and Kansas in the North Central Region. Otherwise, soils are Udolls (or Aquolls), Borolls, or their Alfisol counterparts. The Aquoll determination is a landscape rather than a climatic relationship, and the Boroll (Boralf) division rests on soil temperature. In addition, soils once called Ustolls because of the presence of lime in an otherwise "Udic" soil will no longer be placed with Ustolls, rather with Udolls as their apparent moisture regime suggests. It, therefore, appears that the "tension zone" that exists affects only part of the region. It also appears that judgments about placement of soils in the various categories relating to soil moisture is based on data from climatic models (Newhall) or edaphologic considerations. None are made based on the actual soil moisture regime as defined in Taxonomy. Recommend: (1) that this problem be brought to the Soil Taxonomy Committee with suggestions that modification in Soil Taxonomy reflect the procedure actually used to classify soils where moisture regimes are in question, rather than the presently described criteria that are impossible to test; (2) that climatic models be used to classify soils within these "tension" zones; and (3) that the parameters of the models used be indicated in the descriptions of taxonomic classes developed by use of these models.

Charge 4. Apparently this is deemed a desirable activity by the Committee. Recommend: that the "soil moisture states" be put into use as a mechanism to develop regional soil water information records.

It was recommended that the Committee be continued in view of the presence of an International Committee on this subject, and the activities of NC-109. It is probable and desirable that Committee 3 share its thoughts with these Committees.

Charge A:

What services or types of assistance should constitute "basic soil services"? Listed in order of priority.

1. Training of SCS and non-SCS people (extension agents). Provide training in all aspects of the soil survey with emphasis on interpretative uses and how to make effective use of soil surveys during the planning process.

2. Develop, maintain, and use soil data bases in automatic data processing and technical guides. Work with people in digitizing and utilizing soil maps. Establish soil information systems that will effectively communicate alternate management options for given uses. Coordinate computer generated soil interpretations with technical reports.

3. Prepare routine and devise special soil interpretations. Collect data to improve interpretations. Provide technical leadership in developing soil potential ratings, land evaluations and site assessment reports, soil related land use regulations, etc.

4. Special research studies, soil mapping, and on-site investigation reports.

5. Make periodic reviews of older soil surveys. Assists in recorrelation of surveys, if needed. Coordinate interpretations between soil surveys made several years apart.

Charge B:
Identify the support framework (training and/or information) necessary for soil scientists providing basic soil services (state, NTC, and national level). Listed in order of priority.

1. Training in the following areas:
   - I. Communication skills
   - II. Soil interpretations
   - III. Interpretating and using soil laboratory data
   - IV. Effective presentations
   - V. Working with individuals and groups
   - VI. Resource planning
   - VII. Computers
   - VIII. Management of time
   - IX. Identification and understanding of the users needs
   - X. Soil mechanics
   - XI. Salesmanship
   - XII. Public relations support

2. Computer data base for all completed soil surveys.

3. Staff assistance at the state office, NTC, and Cooperative Extension Service to coordinate and transfer technology between states. States should review all reports that will be published.

4. Support at the national and state levels to assure soils information is properly presented in national and state policy and guidelines. Agencies and professional societies which should lend support are:

   - I. Experiment Station Directors
   - II. Extension Service Directors
   - III. Soil Conservation Service
   - IV. State Departments of National Resources
   - V. Soil and Water Conservation Districts
   - VI. Professional Societies (ASA, SSSA, SCSA, CAST, NACD)
   - VII. Other'federal agencies (FS, BLM, ASCS, FmHA, EPA, HUD, etc.)

5. More research in soil behavior and interpretations.

Charge C:
Identify research needs generated by basic soil services.
Listed in order of priority.

1. Research to support or adjust many of the values on the sol-5 form. Soil permeability and water table studies are especially needed on all soils. Benchmark soils should be given high priority for this research.

2. On-site evaluation of land use interpretations.

3. Productivity of plants as influenced by erosion. Effect of soil crusting and soil compaction on plant emergence and plant response. Yield response to management practices on drastically disturbed lands.

4. Soil landscape studies.

5. Water intake and water movement in soils. Surface and ground water quality as influenced by pesticides, fertilizer, and municipal sludge applications.

Charge D:
How can public benefit of basic soil services be evaluated?
How do we show that basic soil services are cost-effective?

The committee would like to stress that basic soil services lend support to a wide array of disciplines; therefore, public benefits are difficult to evaluate because of the following reasons:

1. Benefits are long term, mid term, and short term.

2. Public benefits are severely clouded.

3. Environmental benefits are difficult to evaluate.

4. Technical assistance may not be utilized.

5. Incomplete and improper utilization of technical assistance.

6. The public has to be educated on the recognition of benefits.

The committee responses to this charge are:

1. By applying the concepts and procedures used in the development of soil potentials and LESA system.

2. Records of measured and observed responses of the services rendered.

3. By demand for additional assistance.

4. Evaluation teams composed of representatives from several public and private agencies.

Charge E:
How can basic soil services be coordinated among SCS, the state experiment Stations, the cooperative extension service, and other NCSS cooperators?

1. Establish NCSS committee or board in the state to coordinate basic soil service requests and identify needs. This Qroup would establish priorities and evaluate work completed.

2. NCSS cooperators need to develop short and long term plans on providing basic soil services in the State. The plans should address:

   I. Objectives
   II. Personnel
   III. Research needed

3. Joint state and regional meeting of NCSS cooperators, such as this one, to discuss issues and develop strategies.

4. Develop and maintain good communication and cooperation of cooperating agencies.

Recommendations:
The committee strongly recommends the continuation of the basic soil services committee. No firm charges are recommended by the committee at this time. However, two possible charges for the future could be:

1. Evaluate the effectiveness of professionals providing basic soil services.

2. What basic soil services can be provided by public soil scientists and consultants2

This report should be made available to the committee developing the charges for the National Work Planning Conference.

ATTENDANCE

COMMITTEE 4 MEETING

June 17, 1986

10:10 a.m. - 12:00 noon

Name	Agency	Location
Larry Tornes (Chairman)	SCS	Columbus, OH
Randy Miles (Vice Chairman)	Univ. of MO	Columbia, MO
Sam Orr	DNR, HO	Jefferson City, MO
Keith Huffman	scs	Colunbus, OH
Tim Gerber	ODNR	Colunbus, OH
Neil Stroesenreuther*	SCS	E. Lansing, MI
Bill Roth*	SCS	Salina, KS
Stephen G. Shetron	Mich. Tech. Univ.	Houghton, MI
Larry Milliron	scs	Medina, OH
Bruce W. Thompson	scs	Colunbia, MO
Bill Broderson	scs	Colunbia, MO
Jim Crum	Mich. State Univ.	E. Lansing, MI
Jim Anderson	Univ. of Minn.	St. Paul, MN
Gary Lemme	SO State Univ.	Brookings, SO
Earl Voss*	SCS	Champaign, IL
Steve W. Payne	scs	Madison, WI
Glem Kelley	SCS	Lexington, KY
Jim Culver*	SCS	Lincoln, NE
Jon Gerken*	SCS	Columbus, OH
Lee Sikes	SCS	Ft. Worth, TX
Pat C. Merchant	FS	Bedford, IN

• Cannittee Member

me following committee members were not present for the committee meeting:

Name	Agency	Location
Leon Davis	SCS	Indianapolis, IN
Dennis Heil	SCS	St. Paul, MN
Christine Lietrau	Mich. Dept. of Agr.	E. Lansing, MI
Earl Lockridge	SCS	St. Paul, MN
Jerry Post	SCS	Lincoln, NE
Richard Rust	Univ. of Minn.	St. Paul, MN
Jerry Tyler	Univ. of Wis.	Madison, WI

North Central Soil Survey Conference
June 16-20, 1986
Columbus, Ohio

Committee 5 Report

Soil Correlation and Classification

There were fourteen persons who served as committee members this year. Committee 5 was assigned two charges by the steering committee.

Charge 1:

To develop criteria that will clearly distinguish C and Cr horizons. The discussion centered on the idea that as bedrock weathers, at some point it passes from being paralithic material to soil material that contains rock fragments.

During the correspondence phase, committee members were encouraged to read a paper by Paetzold and Mausbach in the Soil Science Society of America Journal titled "Hydraulic Properties of some soils with paralithic contacts."

During the conference discussion the conferees observed slides of soft and hard bedrock and soil profiles that contain rock fragments, as a point of reference for the discussions. We also exained the descriptions of the typifying pedons of four official series that are described as having various combinations of C, Cr, and R horizons.

In April of this year notification was received from the national headquarters of SCS that horizon suffix "d" has been approved, and that the definition of horizon suffix "r" is changed to correspond to the introduction of suffix "d".

The definitions are as follows:

d.--Dense unconsolidated sediments. This symbol is used with the master horizon "C" to indicate naturally occurring or manmade, unconsolidated sediments with high bulk density. such as dense basal till and mechanically compacted zone. Roots do not enter except along fracture planes.

r.--Weathered or soft bedrock. This symbol is used with "C" to indicate soft bedrock or saprolite, such as weathered igneous rock, partly consolidated soft sandstone, siltstone, and shale. Roots cannot enter except along fracture planes. The material can be dug with a spade.

The definition of high bulk density is given on pages 603-16 and 603-17 of the National Soils Handbook. One set of values is given as they influence plant growth, and another set as they affect engineering applications.

In the committee discussion it was noted that a proposal has been put forward that Cr horizons will not be limiting for excavations and other engineering interpretations on the soil interpretations record, but only for the growing of plants.

Paralithic *contact" vs paralithic 'material" was discussed during the discussion period. The committee was still faced with the challenge of developing criteria that can be used to separate paralithic material (or Cr or Cd horizons) from C horizons.

The committee recommends: (1) that emphasis be placed on the key phrase common to both the definitions of Cr and Cd, that "roots cannot enter except along fracture planes." The committee further recommends: (2) that additional clarification and guidelines be provided by a national committee for the applications of Cr and Cd in soil descriptions. There are at least three examples that were discussed that need clarification:

1. The intended meaning of the term unconsolidated because some people consider dense till to be consolidated, while others believe the term should only be applied to bedrock.

2. Whether numerical parameters are needed for percentage of rock material vs soil material, especially in the gradational zone of weathered bedrock where rock fragments are still oriented in bedding planes similar to the bedrock.

3. The proper designation of the weathered layer at the upper surface of hard bedrock that is fractured and weathered but has discrete fragments of hard rocks with soil material between them or filling the cracks.

Charge 2:

To examine the suitability of the current range of characteristics for official soil series and, if needed. develop guidelines that will establish suitable ranges for properties of series.

Diverse opinions were expressed that ranges are too narrow and that ranges are too wide. Several ideas were generated relative to ranges or to the kinds of properties we address. There is agreement that ranges should be based upon pedon descriptions and other supporting data and not set wide enough to cover possibilities that might occur. Ranges should not be changed to account for an isolated observation but should be supported by a trend that is documented by several observations.

Several subtopics were identified as items of discussion. A summary of each and the recommendations of the committee follow:

1. Transitional horizons: The committee agrees that in general no ranges are needed for transitional horizons that may or may not be present. Ranges may be advisable if that part of the solum has properties that are critical to taxonomic placement of the pedon; i.e., color patterns that place the pedon in an aquic subgroup. The committee further suggests that the expected thickness of the transitional horizon be stated as follows: "A BA (or other) horizon as much as 6 inches in thickness is present in some pedons."

2. Thickness range for an E horizon: This is one of the master horizons, and not a transitional horizon. The committee recommends: that the pedon be classified in a taxonomic class that best defines the soil forming process under which it formed. Therefore we should state a range of

thickness that we should expect to see in an undisturbed pedon. The thickness requirement should be waived for pedons that are eroded or deeply plowed so that the E horizon is absent. This allows us to classify pedons outside the stated range if we can account for the absence of the layer. It also guards against placing other soils that, because they developed under different soil forming processes, never had an eluvial horizon.

3. Series control section vs taxonomic control section: This discussion centered on soils that have a modern solum formed in two parent materials across a lithologic discontinuity. The series control section is defined in Soil Taxonomy on page 391, column 1. It allows recognition of series differences based upon properties below the taxonomic control section. That definition, however, uses the terminology "diagnostic horizons", which some soil scientists have associated exclusively with those defined in Chapter 3 of Soil Taxonomy. This strict interpretation does not allow series separations in pedons with only a 2BC horizon in the second material instead of a 2Bt horizon. They suggest to name such soils as substratum phases of other series. Other soil scientists believe that those pedons should not be handled as a substratum phase of a soil formed entirely in one material because the 2BC horizon is part of the modern solun and not the substratum. The committee recommends: that this item beferred to the regional Soil Taxonomy committee for consideration. We discussed a proposal to change the wording in Soil Taxonomy to delete the reference to diagnostic horizons and substitute the term "pedogenically altered" horizons. John Witty suggested that a better solution would be to change the wording to clarify the intent that for pedons that have a solun thickness between one and two meters, that the series control section include the entire solum.

4. Geographic distribution of soil series: The concern was that some series are being used so widely over changes in temperature or moisture regimes that the interpretations are not valid, One suggestion is to relate climax vegetation to soil series. The emphasis is to separate soils that support different plant communities. Soil characteristics should be used where possible, but if they are the sane, then use other indicators such as precipitation amounts or distribution, temperature, potential evaporation, growing degree days. or others. The characteristic used should justify another soil interpretations record that will show the difference in vegetation or other soil behavior. The committee attempted to establish guidelines that will identify when to name a phase and when to recognize a new series. There are about 300 unit modifiers listed on page 603-196 of the National Soils Handbook. Many of those are properly used to identify phases of series, but some represent differences that could be criteria for separation of series. The camnittee recommends: that this question be referred for further discussions and clarification. Either this charge be held over for continuation by this committee, referred to the National Conference, or referred to the principal soil correlator to clarify the guidelines of choosing between a phase or a new series.

The committee discussion group ran out of time at this point. We left three items that the committee had considered by correspondence.

Item 5: Better definition of the 0 horizons (leaf litter) on mineral soils. Chapter 4 of the Soil Survey Manual currently states guidelines for subscripts "a", "e", and "i" that are definitive of the degree of deccnnposition. That plus a range of thickness seems adequate to most of the committee members who responded. One point that was made is that more detail is needed in our pedon descriptions in general. Examples are roots and pores, and patterns of soil colors.

Item 6: Salinity and other properties as they relate to soil behavior and the interpretations assigned. Those who commented made the point that differences based upon degrees of a property such as salinity are very difficult to map consistently. Most agree that a reasonable approach is to identify the specific problem such as South Dakota* did with salinity, and then conduct a research project to determine if soils with property values on either side of the boundary can be identified consistently, and if they behave significantly different.

*South Dakota made the following statement concerning salinity in the series control section:

The series control section should give more emphasis to salinity. Soils with less than 2 percent salt but more than 4 mmhos have a significant difference in behavior from soils with less than 4 mmhos. A saline phase can be misleading. Soils with salinity greater than 4 mnhos but less salt than is required for a salic horizon should be considered as a separate series.

Item 7: Use of eroded pedon for series concept. A better way to state this is: selecting and naming a representative pedon for new series that are established on areas so severely eroded or truncated that they no longer classify in existing series. If we establish a new series that classifies as it does because of erosion, how then do we recognize more erosion to name an eroded phase of it? This is more of a cartographic problem than a classification problem. We can recognize and explain the things we are doing. The concern of many people is "how do we show on the soil map or in the legend that these soil landscapes are severely eroded?" The committee offers alternatives: (1) name a different soil series and map a severely eroded phase of it. The eroded pedon may lack essential horizons or properties, however, so the classification is different or the interpretations are different. (2) Name and classify a new series, and explain the eroded landscape in the range of characteristic or in the remarks paragraph. This is the way the situation was handled in the Chatsworth series in Illinois. There is no committee concensus on this item. During the committee oral reports, some conference members suggested that this subject be continued or referred to another committee for further consideration.

The oral report was presented by vice-chairman Micky Ransom. The report was accepted.

North Central Soil Survey Conference
June 16-20, 1986
Columbus. Ohio

Committee 6 Report

Soil Erosion - Productivity Relationships

Charge 1. Identify and prioritize soil

One way to better evaluate the impact of soil erosion on productivity might be to study soils as a group at the family level of Soil Taxonomy. Many of the erosion-productivity studies are showing more yield decreases from erosion on soils formed in glacial till than soils formed in loess. The yield response in the fine-silty grouping of ● oile may be different than the fine-loamy.

The committee atreased that any study should be a long term ● tudy as yearly variations in climate can have a major impact. Tbe committee alro noted that a regional NC-174 committee has been aet up on Soil Erosion-Productivity.

Recommendations: An attempt should be made to evaluate charge 1 at the family level of Soil Taxonomy. This committee should share this report and discussion with the NC-174 committee. Ran Olson will be chairman of the NC-174 committee beginning in July, so this exchange can be made quite easily.

Charge 2. Determine tbe data presently available or needed to support tba estimated impact of soil erosion on productivity.

This discussion emphasized the need to take a bard look at what has been done so far before new studies are initiated. Considering the cost, time, and resources needed to conduct studies, we need to eliminate duplication and make sure tbe studies are well designed.

The committee feels that proper identification and classification of tbe soils in the past, current, and proposed studies would aid in the grouping of soils with similar characteriatica and permit better extrapolation of the resulte. Too often in past studies, factors other tbao the proper identification of the soil were used in the site selection.

Recommendation: The committee feels tbat thin committee lacks the resources to study or review the data available in the detail needed. We recommend tbat this charge be dropped from tbe charges of this committee for the 1988 8011 Survey Conference.

Charge 3. Consider procedures for validation of the output generated by models prereotly available such as EPIC.

The committee stressed the need for better data collection and database development which could then be used to validate or calibrate existing models. Tbe committee is concerned about the currant emphasis on model development without adequate validation. Too often when models are developed, any data not available is simulated. Tbe committee quertiooed bow a model can be developed without experimental data on a large number of different soils with significantly different roil propertier and climate. The point about climate is certainly important as the weather conditions need to be quantified in any model. In the "real situation," we get extreme.9 in weather conditions wbicb ● uet be considered when developing models.

Recommendations: The committee recommends coordination of ● ctivltiee with tbe regional NC-174 committee. This will start with a report on this discussion. Ken Olson, who bas an appointment on both committeea, will provide this exchange. Due to the time and funds required to build a database, the regional NC-174 committee should be batter able to recommend "procedures" for validation or development of a database.

Charge 4. Evaluate the suitability of the present erosion classes with particular attention to rap units. Consider the development of guidelines for clearly distinguishing erosion classes in map unit descriptions.

This is probably the most important of the charges as the committee can have considerable input .

The discussion started with a clarification of the difference between erosion classes and eroded phases. Erosion classes art defined on the basis of the amount of topsoil lost. Eroded phases identify the amount of topeoil remaining and are correlated in the soil surveys baeed on the significance of erosion to the soils uae and management.

The committee feels that good guidelines have not been developed across the region to help soil scientists to clearly distinguish and map eroded phases and that we have not done a good job of describing eroded conditions in the map unit descriptions.

The suggestion was made by Tom Fenton that each state list the criteria they use for defining eroded phases. He also questioned how other states handle E horizons. In other words, is the E horizon treated as part of the surface layer or subsoil? The committee agreed that a survey ahould be taken of each state concerning the guidelines used in identifying and mapping the slightly, moderately, and severely eroded phases. Rod Harner said that the NTC will handle the distribution of this survey.

Charge 5. To determine the need for improvements of the Universal Soil Loss and Wind Erosion Equations.

The committee feels that attempts have been made to use the USLE over too wide a set of conditions. The USLE was not intended for blanket use across cropland, forestland, pastureland, and rangeland. Major problems appear when trying to apply the Wind Eroeion Equation as well as the USLE to aituatione for which they weren't intended. Extended application does not always accurately reflect the erosion and problems with the equations result.

Recommendations: Whatever changes or improvtmtata art made in the equations, the committee stresses the importance of using the equations for the use they were intended. The committee proposes that this charge be dropped from the charges of this committee for the 1988 Soil Survey Conference.

Final Recommendations:

The Soil Erosion-Productivity Relationships Committee agreed that its work is not finished and recommends that the committee be continued. The committee recommends that emphasis be placed on guidelines for distinguishing erosion phases. The following charge is recommended for the 1988 Soil Survey Conference:

Evaluate the suitability of the present erosion phases. Develop guidelines for clearly distinguishing erosion phases in map unit dtecriptions.

We also recommend a continuation of charge 3 for the 1988 Soil Survey Conference and that all future activities of this committee be coordinated with those of NC-174.

Summary of Responses to Charges for
Committee 6 (Soil Erosion-Productivity Relationships)

1. Identify and prioritize roil properties effected by erosion end eveluete their relative impact on productivity.

The soil properties that were identified by the committee as affected by erosion include available water capacity, fertility end organic matter, rooting depth, bulk density, pH, clay content In the surface layer, clay depth distribution, the distribution of soil pore sizes and volumes, and permeability. The committee members generally identified the lose of crop rooting depth and plant available water capacity ae being the moat critical when considering the effects of soil properties on long-term productivity.

Tom Fenton indicated that the soil sufficiency concept as related to crop rooting depth appears to provide valuable insight into the factors effecting productivity. He feels that because field conditions can vary from laboratory measurements on disturbed samples, more field determinations are needed that relate the physical and chemical properties of the surface layer to the rooting environment. The tilth of the surface layer must be quantified more than it has been in the past.

H. Raymond Sinclair diecuased the difficulty in maintaining good tilth. He mentioned that the increase in clay content in the eroded surface layer results in high needling mortelity, poor stead, and herbicide damage to crops. Sinclair also stated that with erosion, as the rooting zone becomes shallower, the available water capacity is reduced by about one half in awe soils.

Ken Olson identified soil parameters in Illinois which appear to be partially reeponeible for the corn yield reductions which were documented ae a consequence of soil erosion phase differences. Reduced plant available water etorege, restricted rooting depth, and increased clay content in the topsoil were the most impacting soil parameters.

Kenneth Olson and Gerald Olson conducted a study la New York State to identify the soil properties that determine a soil's agricultural performance. This was done by relating the yield of corn to the level of input of a number of soil and climatic variables. They concluded that the corn rooting depth was important. In New York State, many eoila have root-restricting barriers including storage capacity (available water) of the soils was significantly reduced when root-restricting layers were present.

Don Patterson stated that plant available water

Stephen Shetron also stressed that important soil properties depend on location. For example, smectite and vermiculite clays are important properties for California forested soils, but not midwest soils. He also stated that we must recognize that erosion models developed for cropland may not apply to forested soils.

Tom Fenton stated that another important aspect to try and sort out is the interaction between slope and erosion class. He feels we need to emphasize the change in soil properties as a function of elope and erosion. He thinks we have not done a good job of informing the users that properties such as organic matter content, clay depth distribution, and depth to clay maximum change by mapping unit.

2. Determine the data preraatly available or needed to support the estimated impact of soil erosion or productivity.

Rod Harner stressed that we need to take a hard look at what has been done so far before new studies are initiated. He is concerned that some studies that have been carried out lack statistical reliability. Results to date should be evaluated and plans developed on that basis. Considering the coat and time required to conduct studies, we need to eliminate duplication and make sure they are well designed.

Tom Fenton said that some people think that most of the present studies are not designed to establish causes and effect relationships. This could be interpreted as requiring uniformity of all management factors on the eroded plots including such things as plant population, soil water supply end fertility levels. In the present studies, crops are harvested from plote that were initially treated the mama, but and up with differences such en in plant populations that are attributed to the affects of erosion on the soil.
Ken Olson has prepared a draft manuscript documenting the effects of erosion on corn yields based on a 2 year study at eight sites (7 common Illinois soils). Based on soil boring observations, two to four replicate .001 hectare plots were located within each of the moderately and severely eroded phases of A soil series. Statistical analyses was used at the P = 0.05 level to determine if there were significant yield and/or soil parameter differences between erosion phases of the same soil series.

D. Rex Mapes noted that at the present time, there is no good way of determining tilth and its effect on root development and productivity.

H. Raymond Sinclair feels that more • tudieo are needed to determine numerics1 values to assign to soil properties as different soils erode from slight to severe erosion. He also thinks thet more needs to be known about how farmers manage small areas of severely eroded soils within a field that is mostly slightly eroded. He feels that many times farmers may have the same cost on severely eroded soils but receive little or no crop yield.

Don Patterson stated that most farm managers and operators do not get too concerned about erosion because technological advances tend to cancel the short-tern effects. He thinks we should concentrate on trying to quantify the effecte of long-tern erosion in terms of changes in soil properties as well as in crop yields. He feels we must develop better estimates of the impact of erosion in both the physical and economic sense.

Stephen Shetron noted that we need more data to study the effect of erosion on forest land as well as cropland. David Smith indicated that studies are needed to reflect the climatic variationa in different areas of the country relative to the affects of soil erosion on forage and fiber as well as organic crops,

3. Consider procedures for validation of the output generated by models presently available much as EPIC.

All the committee members that commented on this charge agreed that before any output can be validated, ● tatietically reliable data is needed.

Ken Olson indicated that a regional committee NC-174 (Soil Erosion-Productivity) has already been set up to develop a 10 state date baae for uae in validating the presently available models such as EPIC. Due to the time end funds required for such an effort, Ken did not think that Committee 6 vould have the time to do more than recommend "procedures" for validation.

Tom Fenton atated that the moat important point is the need to eatablieh a reliable, atatietically valid database where harvested yields are accurately measured end all soil, weather conditions, and management factors that affect yields are quantified.

H. Raymond Sinclair asked how a model can be developed without experimental data on a large number of different roils with significantly different soil properties and climate. He stated that a model is no more reliable then the hard data to aubatantiate it, and today's models are no more accurate than the knowledge on the subject. The need for more models could become evident as more data and knowledge is acquired.

D. Rex Mapes also feels that continued research is needed to verify reaulte of EPIC modeling.

4. Evaluate the suitability of the present erosion classes with particular attention to map units. Consider the development of guidelines for clearly distinguishing eroaion classes in map unit descriptions.

H. Raymond Sinclair feels that greater emphasis needs to be placed on surface layer color in determining erosion, and statements

Rod Harner stressed that in soil surveys we correlate eroded phaeea, not erosion classes. Eroaion classes are defined on the basis of the amount of soil lost. He noted that eroded phases are identified on the significance of erosion to the aoil'a use and management. Erosion claaree can not always be related to eroded phaaee. Harner gave as an example that on some soils, class 2 erosion is not significant to use and management and the soil is not mapped as an eroded phaae. On other soils, claer 2 erosion is highly significant and the soil is mapped as an eroded phase.

Harner feels that we have not done a good job of describing eroded conditions in map units. Erosion is aeldom uniform over a field or map unit. A map unit may contain 2 or more erosion claaeee. Harner preaented the following example as a way to describe the variability of eurface texture and color of eroded incluaione in an uneroded map unit:

"Typically, the eurface layer is brown loam about 7 inches thick. The subsoil is dark brown, fire clay loam about 9 inches thick. The substratum, to a depth of about 60

5. To determine the need for improvements of the Universal Soil Loss and Wind Erosion Equations.

This is probably the most difficult of the charges that this ccamittee has been asked to consider. Everyone agrees that the USLE and Wind Erosion Equations are in need of improvement and work is being done to replace or update these equations at thin time. Current ARS prediction handbooks are being revised. I am not sure what is being considered in these revisions, but as I understand it, the revisions generally are based on data currently available. As A committee, 1 think we need to look to the future and consider what additional data or observations are needed. These equations may not be the best, but as H.R. Sinclair pointed out, we shouldn't be changing the equations unless new and better research dats indicates that modifications are needed.

Researchers at the National Soil Erosion Research Laboratory at West Lafayette, Indiana, and other locations have been working on a new method for predicting soil losses from the action of water. The method is scheduled to be released for testing in April 1989. Known as the USDA Water Erosion Prediction Project (WEPP), it will replace the Universal Soil Loss Equation. A family of models will be developed for water erosion predictions. George R. Foster can be contacted for more information.

An ARS-SCS team has selected 30 soils (list is attached) to undergo a new type of rainfall simulator testing. The new testing will measure rill and interrill erosion separately. The ARS chairman of this effort is George Foster, NSEL, and the rainfall simulator work is led by John Laflen, ARS in Ames. SCS members of the team are Dave Schertz, National Office, and Steve Holthey, NSSL in Lincoln, Nebraska.

In a project similar to the WEPP, ARS is involved in replacing the present Wind Erosion Equation. An ARS team of four agricultural engineers, three soil scientists, and one agronomist has been assigned to the project as well as A project coordinator. The wind erosion prediction system will be flexible in choice of area and time frame - from single to multiple fields and from single erosion events to crop-sequence periods for A number of years. George Cole at Kansas State University is Project Coordinator.

One recent article on wind erosion is in a publication, "Soil Conservation - Assessing the National Resources Inventory." This is a report completed by a Committee on Conservation Needs and Opportunities, Members of the committee included Bill Larson and Tom Fenton from the North Central region.

The report on the Wind Erosion Equation in thin publication concluded that the WEE probably overestimates wind erosion for values of M smaller than 65%. M is the percentage of soil mass In aggregates smaller than 0.84 mm. the report also concluded that the method of correcting for mean wind speed leads to an overestimation of wind speed in most areas where mean wind speed is less than at Garden City, Kansas.

This report indicates that a provisional WEE is proposed that will improve some of the features of the origins1 WEE. It is hoped that an alternative to the original WEE can be proposed if more data is gathered.

In addition to work being done to revise or replace the USLE, much discussion is taking place on ephemeral gully erosion. George R. Foster has done a lot of work on this subject and has published a good article entitled, "Understanding Ephemeral Gully Erosion." He cautions the users of the ephemeral gully erosion prediction methods that the amount of field data available ranges from little to extensive. He slso noted that ephemeral gully erosion is highly variable in space and time, which makes sampling for field measurements difficult and estimated erosion rates subject to large errors.

John Laflan is presently testing a computer program to measure ephemeral gully erosion.

David Smith noted in his comments on the USLE in the semiarid and arid climates of the vest that numerous studies indicate that use of USLE on grassland snd forests consistently overestimate erosion. He recommends that in revising the USLE, the responsible committee should identify and follow-up with the individuals preparing these studies to help develop a more reliable predictive tool.

D. Rex Mapes suggested improving the slope "shape" for the USLE. He referred to a recently published article in the SCSA journsl on this subject.

Stephen Shetron has the following recommendations for refinement of the USLE:

1. USLE only estimates annual soil loss at a particular point source. USLE does not predict sediment loss which is critical to forest soil erosion within a forest watershed. He recommends that sediment yields be etudied.

2. Applicability for modeling forest soil erosion needs to be addressed. Is a different equation needed?

3. Types of clays in soils should be considered to refine soil aggregation.

4. Procedures need to be implemented to clarify, or refine, K factor calculations for proper forest soil adjustments.

Ronald J. Kuehl
State Soil Scientist

I. Cropland Soils (List 4.0)

A. List of Soils

<u>Category I (Highest Priority)</u>

1) Abilene (TX) - fine, mixed, thermic Pachic Argiustoll
2) Anselmo (NE) - coarse-loamy, mixed, mesic Typic Haplustoll
3) Bonifay (FL) - loamy, siliceous, thermic Grossarenic Plinthic Paleudult
4) Cecil (NC) - clayey, kaolinitic, thermic, Typic Hapludult
5) Forman (ND) - fine-loamy, mixed Udic Argiboroll
6) Frederick (VA) - clayey, mixed, mesic Typic Paleudult
7) Grenada (MS) - fine-silty, mixed, themic Glossic Fragiudalf
8) Heiden (TX) - fine, montmorillonitic, thermic Udic Chromustert
9) Keith (NE)(KS?) - fine-silty, mixed mesic Aridic Argiustoll
10) Miami (IN) - fine-loamy, mixed, mesic Typic Hapludalf
11) Pierre (SD) - very-fine, montmorillonitic, mesic Ustertic Camborthid
12) Monona (IA) - fine-silty, mixed, mesic Typic Hapludoll
13) Palouse (WA) - fine-silty, mixed, mesic Pachic Ultic Haploxeroll
14) Ramona (CA) - fine-loamy, mixed, thermic Typic Haploxeralf
15) Salinas (CA) - fine-loamy, mixed, thermic Pachic Haploxeroll
16) Sverdrup (MN) - sandy, mixed Udic Haploboroll
17) Tifton (GA) - fine-loamy, siliceous, thermic Plinthic Paleudult
(OR?) ? 18) Walla Walla (WA) - coarse-silty, mixed, mesic Typic Haploxeroll
19) Williams (ND) - fine-loamy, mixed Typic Argiboroll
20) Woodward (OK) - coarse-silty, mixed, thermic Typic Ustochrept

<u>Category II (Lower Priority)</u>

1) Balcom (CA) - fine-loamy, mixed, thermic Calcixerollic Xerochrept
2) Chester (MD) - fine-loamy, mixed, mesic Typic Hapludult
3) Clarion (IA) - fine-loamy, mixed, mesic Typic Hapludoll
4) Davidson (GA) - clayey, kaolinitic, thermic Rhodic Paleudult
5) Dunkirk - fine-silty, mixed, mesic Glossoboric Hapludalf
6) Mexico (MO) - fine, montmorillonitic, mesic Udollic Ochraqualf
7) Morley (IL) - fine, illitic, mesic Typic Hapludalf
8) Portneuf (ID) - coarse-silty, mixed, mesic Durixerollic Calciorthid
KS? NE? 9) Sharpsburg (IA) - fine, montmorillonitic, mesic Typic Argiudoll
10) Zahl (ND) - fine-loamy, mixed Entic Haploboroll

B. Arrangement by Texture

Sand
- Bonifay

<u>Loamy sand</u>
- Sverdrup
- Tifton

<u>Sandy loam</u>
- Anselmo
- Cecil
- Ramona

<u>Loam</u>
- Balcom
- Clarion
- Williams
- Woodward
- Zahl

silt loam
- Dunkirk
- Grenada
- Keith
- Mexico
- Miami
- Monona
- Palouse
- Portneuf
- Walla Walla

<u>Sandy clay loam</u>
- Davidson

<u>Clay loam</u>
- Abilene
- Forman
- Morley
- Salinas

<u>Silty clay loam</u>
- Frederick
- Sharpsburg

<u>Clay</u>
- Heiden
- Pierre

NC-109 Activities, 1986

Jim Anderson
Dave Lewis

Report to the Soil Survey Work Planning Conference, Ohio State University, June 16-20, 1986.

The North Central Region includes a wide range of climatic areas and soil-geomorphic provinces. The presence of water in soils is usually governed by the climate in which the soil exists and its geomorphic relationships. Because of the wide range of these factors In the North Central Region, research relating soil saturation to soil features that indicate saturated soil zones can make it possible to more completely understand and define the relationship between soil features that indicate wetness and the presence of satuated zones in the soil.

Soil features, such as colors with chromas of 2 or less, contrasting mottles, and hues of 2.5Y or grayer have been established as evidence that a soil is

presence time..96 Tm (7soil.)90043Tf 60.9.3.4286 Twide (features..een w wetnesstlally gove3ecause)67 0.0236 T4 TcTc 4.64 T

January 24, 1986

A PROPOSAL FOR THE CONTINUATION OF NORTH CENTRAL REGIONAL COMMITTEE NCR-3, SOIL SURVEY

Introduction

North Central Regional Committee NCR-3, Soil Survey, continues to serve a useful purpose. Committee members provide the liaison between the respective agricultural experiment stations and the USDA-Soil Conservation Service and other agencies involved in the National Cooperative Soil Survey (NCSS). Communication among agencies with an interest in the NCSS is particularly important at a time when monetary support for soil survey by the USDA-SCS is being maintained or increased in all states within the region. Additional emphasis on field mapping requires more input from experiment station personnel who conduct the research needed for proper roil classification and interpretation.

The main responsibility of the committee is to coordinate research in soil survey among states within the region. Research coordination is accomplished through report and discussion sessions at annual meetings of committee members and advisors. Information is exchanged on pertinent research being conducted at the various experiment stations. Plans are developed for implementing research in areas of need. Published soil survey information is evaluated in terms of its suitability for use in the solution of current and anticipated land use problems. Policies of the NCSS are evaluated with respect to their impact on experiment stations within the region. Appropriate action is taken, when needed, to ensure quality soil surveys that serve the needs of experiment station clientele.

Soil information is being used by more people to solve an increasing number of land use problems. Soil surveys provide a sound basis for the transfer of agricultural technology. The computerized resource databases being developed in many states require large amounts of roil information--soil maps, roil characterization data and interpretations. Many soil management decisions are based on soil surveys; in the future, automated application of fertilizers and other chemicals will be dependent on digitized soil maps. Soil scientists with the professional expertise of NCR-3 committee members must be prepared to provide additional guidance to the public in the use of roil survey information in future years.

Current members and advisors of NCR-3 are:

Illinois	1. J. Jansen
Indiana	D. P. Franzmeier
Iowa	T. E. Fenton
Kansas	M. D. Ransom
Michigan	D. L. Mokma
Minnesota	R. H. Rust
Missouri	R. J. Miles
Nebraska	D. T. Levis
North Dakota	D. D. Patterson
Ohio	N. E. Smeck
South Dakota	G. D. Lemme
Wisconsin	G. B. Lee
USDA-SCS	R. F. Harner
USDA-CSRS	C. M. Smith
Administrative Advisor	S. C. Smith

Purposes of NCR-3

1. To coordinate and plan the activities of experiment stations in the North Central Region relative to the NCSS.

2. To coordinate official NCR-3 representation onnational committees responsible for initiating proposals for changing Soil Taxonomy.

3. To coordinate pedologic research for the region. Many pedological properties are expressed geographically and some soil relationships can be studied most effectively on a multi-state or regional basis.

4. To identify soil and land use problems which may require future research.

5: To exchange information on soil interpretation for agricultural and non-agricultural uses within the region. Soil behavior can be studied over a broad area and the judgements and experiences of people in the various states can be compared and evaluated.

6. To publish, cooperatively, research results with area-wide or regional significance.

Accomplishments of NCR-3

1. Members of NCR-3 regularly represent the North Central agricultural experiment stations on official committees of regional and national roil survey work planning conferences, on committees charged with evaluating and amending Soil Taxonomy, at regional meetings of USDA-SCS state soil scientists and on governmental agency committees in their respective states.

2. Many research techniques and results have been discussed and evaluated in a manner not applicable to larger groups such as the national meetings of the Soil Science Society of America.

3. In cases where research results were not available, recommendations for using soils and/or land for a specific purpose have been made, based on a concensus of knowledgeable committee members. State participation in NCR-3 provides the opportunity for testing individual concepts and judgements among people whose profesaional experience covers a wide range.

4. NCR-3 committee members provided the leadership for establishing Regional Research Committee NC-109.

5. Recent publications that required input from committee members representing all or several of the states in the region are:

   1. Franzmeier, D. P., G. D. Lemme and R. J. Miles. 1985. Organic carbon in soils of North Central United States. Soil Sci. Soc. Am. J. 49:702-708.

2. Hall, G.F., T. J. Logan and K. K. Young. 1985. Criteria for determining tolerable erosion rates. p. 173-187. In R. F. Follet and B. A. Stewart (ed.) Soil erosion and crop productivity. Am. Soc. Agron., Madison, WI.

3. Larson, W. E., T. E. Fenton, E. L. Skidmore and C. M. Benbrook. 1985. Effects of roil erosion on soil propertier as related to crop productivity and claseificatioa. p. 190-210. In R. F. Follet and B. A. Stewart (ed.) Soil erosion and crop productivity. Am. Soc. Agron., Madison, WI.

4. Mannering, J. V., D. P. Franzmeier, D. L. Schertz, W. C. Holdanhauer and L. D. Norton. 1985. Regional effects of soil erosion on crop productivity--Midwest. p. 271-284. In R. F. Follett and B. A. Stewart(ed.) Soil erosion and crop productivity. Am. Soc. Agron.,, Madison, WI.

5. Novak, Peter J., John Timmons, John Carlson and Randy Miles. 1985. Economic and social perspectives on T values relative to soil erosion and crop productivity. p. 120-131. In R. F. Follet and B. A. Stewart(ed.) Soil erosion and crop productivity. Am. Soc. Agron., Madison, WI.

6. Rust, R. R. and T. E. Fenton. 1983. Interlaboratory comparison of soil characterization data--North Central States. Soil Sci. Soc. Am. J. 47:566-569.

Future Plans of NCR-3

1. Members of NCR-3 will continue to coordinate-activities of the NCSS with the agricultural experiment rtatione in the region.

2. The committee will continue to coordinate regional research in soil survey. The need for research in soil survey-continues to increase because soil properties affect a wide array of land uses. Regional consistency in soil interpretation is important.

3. The committee will continue to review and evaluate subject areas for future regional research.

4. A general soil map of the region is being compiled for publication. Preparation of the map has been a major project of the committee. Base map alternatives for publication are being explored.

5. Efforts to collect data needed for various models related to pedology, such as erosion/productivity models, will be coordinated.

6. Committee members will coordinate rtate and regional efforts to develop computerized soil information databases.

Regional Committee NCR-3, Soil Survey, is scheduled to terminate September 30, 1986. On behalf of the current committee members, I respectfully request thst the committee be extended from October 1, 1986 through September 30, 1989.

Submitted by,

Donald D Patterson

Donald D. Patterson
Chairman, NCR-3

NORTH CENTRAL SOIL SURVEY CONFERENCE

OF THE NATIONAL COOPERATIVE SOIL SURVEY

PURPOSE, POLICIES, AND PROCEDURES

1986 (REVISED)

I. Purpose of Conference.

The purpose of the conference is to bring together North Central States representatives of the National Cooperative Soil Survey for discussion of technical questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; naw areas are explored; procedures are proposed; and ideas are exchanged and disseminated. The conference also functions as a clearinghouse for recommendations and proposals received from individual members and state conferences for transmittal to the National Cooperative Soil Survey Conference. It also acts on recommendations from the national conference and other regional conferences.

II. Membership.

Participants of the conference are the soil scientists of the North Central Region (Ill., Ind., Iowa, Kans., Mich., Minn., MO., Nebr., N. Dak., Ohio, S. Dak., and Wisc.) which the cooperating agencies wish to send (each agency shall notify the Head, MNTC Soils Staff, of any changes in its representatives), and a representative of the SCS National Headquarters Soil Survey Division. Any soil scientist or other technical specialists of any state or federal agency or private enterprise whose participation would be helpful for particular objectives or projects of the conference may attend. Interested persons in the host state are also welcome to attend.

III. Meetings.

A. Time of Meetings.

The conference will ordinarily convene every 2 years in even-numbered years. Time of year is determined by the conference chairman. Additional meetings may be called by request of the steering committee or the conference with the administrative approval of the participating agencies.

B. Host State.

The host state is determined two meetings in advance; (e.g., the 1986 conference selects the host state for 1990, the 1988 conference selects the host state for 1992, etc.). During the conference business meeting invitations from the various states are considered and voted upon. A simple majority vote decides the host state. The conference may be held et any suitable location within the host state.

C. Separate Meetings.

The North Central Regional Committee No. 3 (NCR-3) on soil surveys generally will meet during the conference. Concurrently, soil scientists of the other cooperating agencies will meet to discuss their problems.

IV. Officers and Steering Committee.

Officers rotate among agencies. That is, the chairman must be of a different agency than the past chairman. Similarly, the secretary must be of a different agency than the past secretary. At each biennial conference a secretary is elected for the succeeding conference. The secretary becomes chairman when their successor is elected. When an officer is unable to complete their term of office, the steering committee shall appoint a successor.

A. Chairman.

The chairman is from the host state. Responsibilities include the following (specific tasks may be delegated to the secretary):

1. Functions as head of the Steering Committee.

2. Plans and manages the biennial conference.

3. Determines, with assistance of the steering committee, the kinds of committees, selects the committee chairmen and assistant chairmen, formulates and transmits charges to committees, and appoints committee members.

4. Issues announcements of and invitations to the conference.

5. Wrltes the program and has copies prepared and distributed to the membership.

6. Makes necessary arrangements for: food and lodging accommodations; special food functions; meeting rooms (including committee rooms); and local transport for official functions.

7. Provides for appropriate publicity for the conference.

a. Presides at the business meeting of the conference.

B. Secretary.

The secretary is from the state that will host the succeeding biennial conference. The secretary for the succeeding conference is elected by simple majority vote after the host state is chosen for the meeting to be held in 4 years. Nominations for secretary come from the floor.

Responsibilities of the Secretary Include the Following:

1. Functions as a member of the Steering Committee.

2. Functions as secretary to the conference.

3. Assembles and distributes the proceedings of the conference.

4. Performs duties as assigned by the chairman.

C. Steering Committee.

A steering committee will assist in the operation of the conference. It shall consist of the chairman as head, the secretary, the Head, Soils Staff for the Midwest National Technical Center, the chairman of the NCR-3 committee, and the past conference chairman.

Responsibilities of the Steering Committee:

1. Assists in the planning and management of the conference.

2. Assists in the selection of committee chairmen and assistant chairmen and in the selection of committee members.

3. The committee will meet once after the business meeting of each conference and may meet at other times if necessary.

4. Most of the committee's communications will be in writing. Copies of all correspondence between members of the steering committee shall be sent to each member of the committee.

5. The steering committee assists in the selection of special participants in a specific regional conference.

6. The steering committee assists in the formulation of charges to committees.

7. The Head, Soils Staff, maintains the conference membership list and distributes it to the incoming chairman.

D. Advisors.

Advisors may be selected by the steering committee or the conference.

E. Committee Chairmen.

The chairman of each committee is selected by the conference chairman.

V. Committees.

A. Most of the technical work of the conference is accomplished by duly constituted committees.

B. Each committee has a chairman (committee chairmen are selected by the conference chairman). A secretary, or recorder, will be selected by the committee chairman.

C. Each committee has an assistant chairman who succeeds to the position of chairman for the following conference.

D. The kinds of committees, and their members. are determined by the conference chairman. In selecting committee members consideration is given to expressions of interest filed by the members, suggestions of the steering committee, efficient continuity of the work, and the technical proficiency of the members of the conference.

E. Each committee chairman shall give a verbal summary at the designated time at each biennial conference. These committee report8 shall be written by the committee chairman as per instructions from the steering committee. The report shall have a statement on the action taken on it by the conference. Chairmen of committees are responsible for submittal of one camera-ready copy of committee reports to the secretary within 30 days of the conference.

F. Much of the work of committees will, of necessity, be conducted by correspondence between the times of biennial conferences. Committee chairmen are charged with responsibility for initiating and carrying forward this work. They shall provide their committee members with the charges as directed by the steering committee, and whatever additional instructions they deem necessary for their committees to function properly. Chairmen should initiate committee work at the earliest possible date.

VI. Representation to the National Soil Survey Conference.

Representatives to the steering committee for the National Cooperative Soil Survey Conference will be the Head, Soils Staff, MNTC, and a state delegate from the previous host state for the North Central Soil Survey Conference. The state delegate will be chosen during the NCR-3 separate session. Delegates to the National Cooperative Soil Survey Conference will be the Bead, Soils Staff, MNTC, one state soil scientist, and two state representatives (with appropriate administrative approval). The state soil scientist and state representatives will be chosen by simple majority vote during the separate sessions.

VII. Historical Record.

A cumulative file of conference programs shall be turned over to each incoming conference chairman.

VIII. Amendments.

Any part of this statement of purposes, policy, and procedures can be amended at any time by simple majority vote of the participants attending the business meeting.

Record of North Central Soil Survey Conference

Year	Location of Meeting	Chairman
1955	Missouri	Ableiter, Aandahl
1956	Michigan	Westin
1957	Illinois	Bartelli
1958	Wisconsin	Bidwell
1959	Kansas	Rogers
1960	Indiana	Elder
1961	North Dakota	Engberg
1962	Ohio	Biecken
1964	Nebraska	Nelson
1966	Iowa	Ulrich
1968	Minnesota	Mitchell
1970	Illinois	Fehrenbacher
1972	South Dakota	Bannister
1974	Missouri	Scrivner
1976	Michigan	Barner
1978	Wisconsin	Hole
1980	Indiana	Sinclair
1982	North Dakota	Patterson
1984	Kansas	Poth
1986	Ohio	Smeck
1988	Nebraska	Culver
1990	Iowa	Fenton

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NATIONAL COOPERATIVE SOIL SURVEY

North Central Soil Survey Conference Proceedings

Manhattan, Kansas
April 2-5, 1984

Steve Holzhey
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X

PROCEEDINGS OF

NORTH CENTRAL SOIL SURVEY CONFERENCE

OF THE

NATIONAL COOPERATIVE SOIL SURVEY

MANHATTAN, KANSAS

APRIL 2-5, 1084

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

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NORTH CENTRAL SOIL SURVEY CONFERENCE
Manhattan, Kansas
April 2-5, 1984

AGENDA

April 2, 1984

Monday - p.m.

7:30-10:00	Registration and Socializing

April 3, 1984

Tuesday - a.m.

8:00-8:15	Welcome - John W. Tippie
8:15-8:30	Opening Remarks - William Roth
8:30-10:30	Meeting of Committee 1 - Improving soil survey techniques and modernizing soil surveys - Mark Kuzila, Chairman Meeting of Committee 5 - Soil correlation and classification - Richard Rust, Chairman
10:30-11:00	BREAK
11:00-11:45	Soil Potential Ratings for Rangeland - Ken Hladek
11:45-12:45	LUNCH

Tuesday - p.m.

12:45-2:45	Meeting of Committee 2 - Soil Interpretations - Alexander Ritchie, Chairman Meeting of Committee 4 - Educational activities for soil resources and land use - Milo Harpstead, Chairman
2:45-3:00	BREAK
3:00-5:00	Tour of Wind Erosion Lab, KSU - Dr. Leon Lyles

April 4. 1984

<u>Wednesday - a.m.</u>

: -ll:oo	Separate meeting of participants from land-grant colleges (NCR-3) and participants from SCS
11:00-12:00	Erosion Productivity Impact Calculator (EPIC) Model - Wes Fuchs and Dr. Paul Dyke
12:00-12:45	LUNCH

<u>Wednesday - p.m.</u>

12:45-2:45	Meeting of Committee 3 - Soil-water relations including water movement in soil landscape - Erling Gamble, Chairman Meeting of Comnittee 6 - Classification, interpretation, and modification of soils on mine spoil and disturbed soils - Wells Andrews, Chairman
2:45-3:15	BREAK
3:15-5:30	Konza Prairie - Or. Lloyd C. Hulbert
6:00-7:45	Social Hour and Dinner Speaker - Dr. Robert A. Bohannon 'Using the Soil Survey in Conservation Tillage'

April 5. 1984

<u>Thursday - a.m.</u>

8:00-8:45	Ground Penetrating Radar - Greg Schellentrager
8:45-9:15	Washington Report - Richard Arnold
9:15-10:15	Committee Reports
10:15-10:45	BREAK
10:45-11:45	Comnittee Reports
11:45-12:30	LUNCH

<u>Thursday - p.m.</u>

12:30-1:15	A Farmer Looks at the Soil Survey - Jim Lukens
1:15-1:45	International Soils Program - Richard Fenwick
1:45-2:45	Committee Reports
2:45-3:15	Discussion, Business Meeting, Closing Comments

REGISTRANTS
NORTH CENTRAL REGIONAL TECHNICAL WORK PLANNING CONFERENCE
Manhattan, KS
April 3-5, 1984

Wells F. Andrews

Richard W. Arnold

- James Baker

Steve R. Base

Orville W. Bidwell

Bill Broderson

John I. Brubacher

Edward L. Bruns

Richard L. Christman

James R. Culver

Leon B. Davis

Marvin L. Dixon

James L. Jacobson

Ivan Jansen

John Kotar

Ronald J. Kuehl

Mark S. Kuzila

Donald Last

Gerhard B. Lee

Gary D. LemmeLemme

Registrants (cont.)

Miles W. Smalley

Neil E. Smeck

James H. Thiele

Bruce W. Thompson

Michael L. Thompson

Larry A. Tornes

Kenneth D. Vogt

Larry D. Zavesky

Ted M. Zobeck

COMMITTEE ASSIGNMENTS

NORTH CENTRAL SOIL SURVEY CONFERENCE

Committee I - Improving Soil Survey Techniques and Modernizing Soil Surveys - Mark S. Kuzila, Chairman

Members

George W. Hudelson, Vice Chairman
Leon B. Davis
Paul E. Minor
James R. Culver
Walter E. Russell
Charles S. Fisher
Richard Bond
Sylvester C. Ekart
Earl E. Voss
Keith K. Huffman
Louie L. Buller
Roy M. Smith
Steve R. Base
Frank L. Anderson
John Kotar
Gary Le Masters
John I. Brubacher
Christine E. Leitzau

Committee II - Soil Interpretations - Alexander Ritchie, Jr., Chairman

Members

Garv D. Lemme. Vice Chairman
John Nixon
Raymond T. Diedrick
James L. Anderson
Wells F. Andrews
James H. Thiele
Miles W. Smalley
William D. Broderson
Larry A. Tornes
Jon C. Gerken
Paul R. Johnson
Carl Trettin
William D. Hosteter
Donald D. Patterson
George F. Hall
Robert Darmody

Committee III - Soil-Water Relations Including Water Movement in Soil Landscapes - Erling Gamble, Chairman

Members

Dave Lewis, Vice Chairman
Jerry D. Larson
Lester J. Bushue

Committee IV - Educational Activities for Soil Resources and Land Use - Milo I. Harpstead, Chairman

Members

Laurence E. Brown, Vice Chairman
Roger Haberman
Robert S. Pollock
Gary L. Steinhardt
Steve Messenger
Gerald A. Miller
Dave Lewis
Doug Malo
Gerhard B. Lee
Steve Holzhey
Bill Eberle
Christian J. Johannsen
Robert Pope
Joseph E. Yahner
E. A. Tompkins

Committee V - Soil Correlation and Classification - Richard H. Rust, Chairman

Members

J. Wiley Scott, Vice Chairman
Ronald J. Kuehl
Neil E. Smeck
Marvin L. Dixon
Gilbert R. Landtiser
Bruce W. Thompson
Edward L. Fleming
Neil W. Stroesenreuther
Edward L. Bruns
Larry D.

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

Manhattan, Kansas
April 2-5, 1984

Minutes

The 1984 biennial meeting of the North Central Technical Work-Planning Conference of The National Cooperative Soil Survey was called to order by Chairman William Roth at 8 A.M. on April 3, 1984. The Chairman then introduced John W. Tippie, State Conservationist for Kansas, who welcomed everyone to Kansasandpresented a multi-projector slide presentation which reviewed erosion in the Great Plains, the establishment of the Soil Conservation Service, and the role of that agency in the preservation of our soil resources. Chairman Roth then introduced the representatives from the Washington office, Dr. Richard W. Arnold and Richard W.Fenwick, and then issued general instructions for the conference. The general session was then adjourned for committee deliberations.

General sessions were periodically reconvened for special reports which are included in the Proceedings of the Conference. Likewise, the committees reports, presented to the general session of the conference on April 5, are also published in the Proceedings of the Conference.

The business meeting of the conference was convened by Chairman Roth on April 5, 1984. The minutes of the 1982 conference were read and a motion to accept the minutes as published in the Proceedings of the 1982 conference was moved and passed. Appreciation was expressed to both Bill Roth and Orville Bidwell for making local arrangements for the conference, Upon the approaching retirement of Dr. Bidwell (June 30, 1984), a motion was moved and unanimously approved to include the following commendation in the minutes: "Members of the North Central Soil Survey Conference wish to express their appreciation to Dr. Orville Bidwell for 34 years of dedicated service to the Cooperative Soil Survey Program". Jim Culver representing Nebraska extended an invitation to host the 1988 conference. A motion was moved to accept the invitation from Nebraska and was overwhelmingly approved. Consequently, Jim Culver was elected Secretary for the 1986 Soil Survey Conference to be held in Ohio. Jim Culver will then succeed to Chairman for the 1988 conference in Nebraska. Being no further business, the meeting was adjourned.

Neil Smeck
Secretary

NCR-3 SOIL SURVEY COMITTEE
Minutes of Meeting, April 4. 1984
Ramada Inn
Manhattan, Kansas

Attendance:

Illinois	Ivan Jansen* (Univ. of Ill.)
Indiana	Don Franzmeier* (Purdue Univ.1
Iowa	Tom Fenton*, Gerald Miller, Michael Thompson (Iowa State)
Kansas	Orville Bidwell*, Robert Bohannon (Kansas State)
Michigan	(No representative)
Minnesota	(No representative)
Missouri	Randy Miles': (Univ. of Mo.)
Nebraska	Mark Kuzila (Univ. of Neb.)
North Dakota	Don Patterson* (N. Dak. State)
Ohio	Neil Smeck*, Ted Zobeck (Ohio State); Richard Christman (Div. of Soil' and Water Cons., ODNR)
South Dakota	Gary Lemme* (S. Dak. State)
Wisconsin	Gerhard Lee* (Univ., Madison); Milo Harpstead, Don Last (Univ.. Stevens Point)
Northeast Region	James Baker, Dept. of Agronomy, VPI + SU, Blacksburg. VA
SCS-USDA	Erling Gamble, SCS, Midwest National Technical Center, Lincoln. NE
CSRS-USDA	Gary Evans*, CSRS, Rm 121 II. Auditors Bldg., USDA, Washington, D.C. 20251
Administrative Advisor	Stephan Smith*, Univ. of Wis., Madison

* Committee member

Chairman Jansen opened the meeting at 8:00 am. He read the minutes of the November 2-3, 1983 meeting and they were approved. He asked Mike Thompson to represent NCR-3 at the meeting of federal people scheduled concurrently with this one. Secretary Franzmeier recorded these minutes.

Elections-Appointments:

Gary Lemme (3 yr.) and Randy Miles (2 yr.) were elected to Serve on the Regional Soil Taxonomy Committee.

Don Patterson was elected secretary.

Neil Smeck and Don Franzmeier were appointed to represent the committee at the 1985 National Technical Work Planning Conference.

Soil Survey Horizons - Newsletter:

Gerry Miller reported that Soil Survey Horizons needs more subscribers to break even financially. He suggested that each person at the meeting makes sure his library subscribes, Also, in some states the soil classifier association purchases subscriptions for each member, and more states might consider this arrangement. The quality of manuscripts has been steadily increasing; they all have a technical review.

Neil Smeck reported that a national newsletter for personnel news etc. was proposed at the last national conference and inquired about interest in the North Central Region. No one volunteered to lead the project. It was the consensus that some region and national news could be included in Soil Survey Horizons.

Milo Harpstead will write a report about the Workshop for Soil Survey Horizons.

Organic Carbon Manuscript

Don Franzmeier sent a draft of a manuscript on the organic carbon content of soils of the region. It contains estimates of the C content to depths of 0.2 and 1.0 m in the map units of NCR Publication No. 76 (1960) and smaller scale maps of the region. It will be submitted to Soil Science Society of American Journal. If he receives no comments from a state by April 18, he will assume there are none.

Regional Soil Map

Tom Fenton has received maps from all except three states. If your state is one of them please send a map to him. He is investigating various base maps. A bulletin will be issued with the map, but the map will contain sufficient information so that it can stand alone. On the map the units will be described like they are on the Nebraska map. An example of the table from that map is attached, and copies of it are available from Mark Kuzila, Conservation and Survey Division, University of Nebraska, Lincoln, NE 68588-0517. He also has extra copies of NC Bulletin 76 available.

Action Requested for Regional Map:

1. Finalize name of map units
2. Group them according to suborder. The state with the largest area of a unit is responsible (see previous assignments). Send this to Fenton before June 1.
3. Complete table like the example attached.

Administrative Comments:

Dean Smith, administrative advisor, pointed out that the reports from the individual states are especially useful to administrators and a standard format should be considered (see state report section). In future state reports it will be useful to include examples of how soil survey relates to other activities such as modeling, computer storage of maps, land information systems, etc.

Gary Evans, CSRS. reported that the budget looks about the same as it has in previous years. The good news was that several Experiment Stations had completed reviews (Iowa State, North Dakota, Purdue) or are currently being reviewed (Minnesota). He suggested that NCR-3 might coordinate discussion of redirection of efforts when the current phase of mapping is completed. He also mentioned, three publications that might'be of interest, and they are being mailed to committee members.

Joint Council on Food and Agricultural Sciences:
FY 1985 Priorities for Research, Extension, and Higher Education.
Summary: Needs Assessments for the Food and Agricultural Sciences (Jan. 1984).
Experiment Station Committee on Organization and Policy, CSRS:
Research 1984.

Jim Baker representing the Northeast Region reported that a NE committee of Experiment Station pedologists has been formed. He suggested that the NE and NC groups meet together sometime.

SCS Meetings:

The committee requests that the SCS regional correlator notify the chairman and secretary of NCR-3 of meetings tnat might be of interest to experiment station people so that the committee could send a representative if invited to do so.

State Reports:

State representatives reported on the status of the survey in their state, Little progress was made since the November meeting because most of the region has been covered with snow or mud since then. The attached progress report summarizes the status in each state, It was compiled from figures furnished at and after the meeting by committee members.

The meeting adjourned at 11:00 a.m. The next meeting will be scheduled for the fall of 1965. probably with the NC-109 meeting.

Status report of soil surveys in the North Central Region, April, 1984.

State	Counties					Field Soil Survey Scientists			Est. Compl. Date
	Total	Pub-lished	In Press	In Prog.	Waiting[1]	Federal		State & Local	
						SCS	Non-SCS		
IL	102	46	11	21	24	38	0	27	1991
IN	92	59	25	8	0	16(4)[2]	0	11	1987
IA	99	61	13	20	5	47(21)[2]	0	0	1988
KS	105	84	8	10	3	23	0	0	1987
MN	87	41	9	18	19	30	2	24	1992
MO	107	34	16	23	34	25	0	24	1994
NE	92	61	14	15	2	21	0	13	1987
ND	53	23	3	10	17	28	0	5	2000
OH	88	55	14	16	3	23	0	16	1990
SD	67	44	9	13	1	30	5	0	1988
WI	73	46	3	10	14	24	3	1[3]	2004

[1] Includes planned updates of entire county.

[2] Number of SCS field soil scientists (or FTEs) whose salary is granted to SCS from state and local funds.

[3] Contract mapping for U.S. Forest Service.

Session for Federal and State Agencies
NORTH CENTRAL SOIL SURVEY CONFERENCE
Manhattan, Kansas
April 4, 1984
Rodney Harner, Chairman

The representatives of federal and state agencies met from 8 to 11 a.m. Mike Thompson represented the NCR-3 soil survey committee. The following is a summary of the items covered in the session.

The membership of the regional committee for making changes in soil taxonomy is being updated. Neil Stoesenreuther and George Hudelson have been reappointed. Their terms expire in April 1986 and 1987, respectively. Bill Roth's term expires in April 1985. The NCR-3 committee will select replacements for Joe Fehrenbacher and Dave Lewis. The work of the committee is expected to increase. The help of others to review proposals will be enlisted as the need arises.

Edit MUUF printouts that states receive from Ames for recently correlated surveys need to be reviewed and returned to the NTC. The NTC will review and return to Ames. This completes the "circuit" for the file and Ames makes final entry of the file. The National Soils Handbook contains the JCL for updating the MUUF. Shortly the MUUF will be linked with the SCS-SOI-5 data in CERL's Multiple Parameter Series Search Program. This will provide users with extent and location, by county, of soils with properties or classification searched for.

The following workshops and conferences have been proposed for fiscal year 1985.

December 3-7, 1984 Workshop for soil scientists responsible for manuscripts and interpretations.

February 4-8, 1985 State Soil Scientists Conference.

The NTC has had to delete participation in 10 initial reviews during the remainder of the fiscal year because of increases in travel costs and unexpected demands for travel. In the next NTC schedule they will be listed as tentative as far as participation from the NTC. The reviews put on tentative status include five in Illinois, two each in Michigan and Minnesota, and one in Iowa.

The alphabetical list of map units that goes in correlations that have numeric map symbols will be computer generated in the NTC. The state does not have to send in the alphabetical list with the field correlation. The computer generated list will be strictly alphanumeric and will not follow all of the conventions for order of listing map units. For example, Alpha silt loam, 10 to 14 percent slopes will be listed before Alpha silt loam, 6 to 10 percent slopes because 1 is a lower number than 6. The legend will be adequate for use in correlation and reviewing manuscripts.

A guide to interpretative groups for map units can be generated in the NTC. It is inserted in the back of the manuscript after the tables. The guide does not have a table number. Interpretative groups, such as land capability, range site, windbreak group, are listed for each map unit. No page numbers are given in the guide.

We need to move toward compatibility of word processing equipment as rapidly as possible. Objective is to key manuscripts, series, etc., one time and then revise and update on word processing equipment. On March 19, 1984, a questionnaire went to the states that will provide information about present compatibility and future needs.

States should not submit field correlations until documentation is complete. This includes laboratory data, series revisions, new series descriptions, etc. Also, the manuscript needs to be reviewed in the state office before it is submitted for correlation. Correlations that are not complete or manuscripts that have not been reviewed will be returned to the state.

A briefing paper on the size of photographs in soil survey manuscripts by Stan Anderson was handed out.

States have been asked to indicate the date that the maps will be sent to the NCC when they submit a manuscript for editing. It is very important that the NTC know this date. It will be used in conjunction with schedules from the NCC to set priorities for editing. We must coordinate delivery dates for manuscripts and maps.

States need to take a close look at climate data, both from Ashville and in-state sources. Errors are showing up.

The National Cartographic Center continues to give a very thorough edit check to all completed map finishing jobs. All noted errors do occur; however, many of these are not related to the soil survey and we do not consider them serious enough to send the job back for additional checking.

The MNTC has started to suggest tints to be used on the general soil map. If the states wish they can suggest these tints when submitting their manuscript for edit.

The MNTC will check into the possibility of using a larger scale base map for the general soil and index maps. A suggested scale for an average size county might be 2 miles to the inch. However, the discussion at the workshop indicated that the states would prefer to keep the present scale maps but to show more detail so users could more easily use them.

Recently there was a Carto representative workshop. Since over 60 percent of NCC's work is on NCSS, many of the handouts from this meeting deal with the soils program. It is suggested that all state soils staffs be familiar with this material since it will likely answer many soil related questions.

The guides to be used for soil woodland interpretations are those issued by RTSC SOILS MEMORANDUM-LI-2 on October 18, 1973. Volume figures can be added to the woodland table. Ames has changed all 0 subclasses to subclass A and slope (R) takes presidence over all other limitations. These are the only changes that have been made in Ames to agree with the National Forestry Handbook.

A need was expressed to list more species for windbreaks in the soil survey manuscript. This could best be done by windbreak groups. The Midwest NTC will examine the possibilities for doing this.

SOIL POTENTIAL RATINGS

FOR RANGELAND

POTTAWATOMIE COUNTY, KANSAS

* Kenneth L. Hladek, Range Conservationist
Paul R. Kutnink. Soil Scientist

Soil potential ratings for rangeland in Pottawatomie County. Kansas. were developed in 1982 with the assistance of numerous individuals. Conservation district supervisors in particular, all of whom are local ranchers, provided invaluable advice and many helpful suggestions.

Seven criteria, representing either continuing limitations or corrective measures, were selected to evaluate soils for their rangeland potential. These criteria were:

1. Forage production
2. Grazing accessibility
3. Woody plants
   a. Invasion rate
   b. Treatment difficulties
4. Soil depth
5. Available water capacity
6. Runoff/Run-in
7. Fencing difficulties

The numerical ranking of each mapping unit based on the seven evaluating criteria, resulted in five rather distinct separations as shown below:

Soil Potential Index	Range Potential
100 99 98 97 96 92	VERY HIGH
89 87 78	HIGH
67 60 59 58 57 55 54	MEDIUM
50 49 48 47 42	LOW
30 29 26	VERY LOW

It appears that the rangeland potential of soils in Pottawatomie County, Kansas, can be adequately expressed using the seven evaluating criteria previously discussed. Other counties in Kansas and other states, however, will need to add to or delete from these evaluating criteria as appropriate relative to their own local conditions.

* Kenneth L. Hladek previously area range conservationist located at Manhattan, KS
Paul R. Kutnink is soil survey party leader in Pottawatomie County, KS

EROSION PRODUCTIVITY IMPACT CALCULATOR (EPIC)

Dr. Paul Dyke and Wes Fuchs

The Soil and Water Conservation Act (RCA) of 1977 required the USDA to establish the current status of soil and water resources in the U.S. USDA responded by forming the National Soil Erosion- Soil Productivity Research Planning Committee to document to what is known about the erosion/productivity problem, to identify the need for additional information, and to outline a research approach for seeking solutions to the problem (Williams et al, 1981). One of the most urgent needs identified by the Committee was the development of a mathematical model for simulating erosion, crop production, and related processes. The output of the modeling effort is the Erosion-Productivity Impact Calculator (EPIC) model (Williams, Oyke, Jones, 19821.

The EPIC model is a physically based process model that integrates the soil-climate-plant-management processes in crop production. EPIC consists of eight major divisions: hydrology, weather, erosion, nutrients, plant growth, soils, tillage, and economics. EPIC runs on a daily time step, uses randomly generated weather, and uses SCS soil pedon characterization. data. The model assumes optimum plant stand and strives for optimum crop yield. It is a collection of the state-of-the-art component process models operating in an integrated fashion. EPIC was developed by a multidiscipline 'interagency team with most of the activities taking place at the USDA-ARS, Grassland, Soil and Water Research Lab at Temple, Texas. Three USDA agencies (ARS, ERS, SCS) and Texas 'A & M University are the major participants.

EPIC will be used to provide soil erosion/soil productivity relationships for use in the RCA/CARD model for the 1985 RCA Analysis. For the current RCA cycle the EPIC model is using a representative soil series with soil pedon characterization data to represent the RCA Land Groups in each of the MLRA's.

Seventeen MLRA's were selected for validation. These were completed in October 1983 with some additional adjustments and reviews in February 1984. All fifteen MLRA's of the Cornbelt are being run at this time to develop interpolation and presentation procedures. The production runs for all 168 MLRA's are to be completed this summer.

Literature Cited

Williams, J.R. 1983. The physical components of the EPIC Model. Proceedings International Conference on Soil Erosion and Conservation, Honolulu, HI, Jan. 16-22, 1983.

Williams, J.R., P.T. Dyke, and C.A. Jones. 1982 EPIC--A model for assessing the effects of erosion on soil productivity. Proceeding Third International Conference on State-of-the-Art in Ecological Modeling, Colorado State University, May 24-28, 1982.

KONZA PRAIRIE RESEARCH NATURAL AREA

by Lloyd C. Hulbert, Director
Division of Biology, Kansas State University, Manhattan, KS 66506

Konza Prairie Research Natural Area is a 3487 ha (8616 acre) area of tallgrass prairie purchased by The Nature Conservancy in 1971 and 1977 and provided to Kansas State University for ecological research. About 4% of the lowlands was plowed at some time in the past, 6% is in forest, and the rest is unplowed tallgrass prairie. To facilitate study of the natural grassland system, a research management plan has been instituted that involves combinations of burning and grazing. Four or more replications of 7 burning treatments are underway on a portion to be kept ungrazed. The burning treatments are unburned, burned at 1, 2, 4, and 10 year intervals, burned after unusually wet years, and burned for 3 and then unburned for 3 years. About 1200 ha are to be grazed by native grazers: bison, elk, and pronghorn. Another part of the area is to be grazed by cattle at the same stocking rate so we may compare the effects of native grazers and cattle. The grazing studies await completion of the fence, which will be 8 ft high with 15 wires, alternately charged and grounded. We hope to introduce the animals in 1985.

Studies are underway on the vegetation, insects, rodents, birds, soil, streams, and other components of the system. We believe these studies will provide information of value in management of human support systems. We are planning studies to ascertain the effects of cultivation agriculture on the chemical, physical, and biological properties of the prairie soil. Because the tallgrass prairie area is highly valuable for agriculture, such studies should be especially valuable. This and other studies need to be long-term and involve interdisciplinary cooperation. Scientists interested in studies on Konza Prairie should contact the director for information and for a research application form.

APPLICATION OF GROUND PENETRATING RADAR (GPR) to the NATIONAL COOPERATIVE SOIL SURVEY PROGRAM

SUMMARY

In recent years increased attention has been focused on a unique radar system which produces a continuous profile of subsurface conditions. Known as Ground Penetrating Radar, this new technology has been specifically designed and used as an efficient reconnaissance and investigative tool. Investigators working in earthen materials have. found that this new technology permits meaningful observations to be made in many kinds of soils. In 1978 the Soil Conservation Service (SCS), in cooperation with the National Aeronautics and Space Administration (NASA), and Technos, Inc. of Miami, FL, investigated the potential of using Ground Penetrating Radar in soil surveys. The Ground Penetrating Radar was found to have the ability to detect, range and trace the lateral extent of many soil horizons.

Soil interfaces which produce strong reflections in mineral soils include the following: albic, argillic and spodic horizons; lithic, paralithic and water tables, roots and lamellae in some coarse-textured soils. In organic soils Ground Penetrating Radar technology is being used to: determine the depth and thickness of organics, characterize and profile sediments at the base of organic deposits, estimate the degree(s) of humification, and classify organic soils.

Interfaces which produce weak reflections include the following calcic and peteocalcic horizons, zones of plinthite and reticulate mottling, and contacts between moderately fine or fine-textured argillic horizons and limestone bedrock. Subtle boundaries, such as a slight or gradual increase or decrease in texture, color or organic matter content, also produce weak reflections.

The actual depth to soil horizon interfaces is easily determined and their lateral continuity defined by correlating a limited number of soil borings with the graphic printout. Usually, one soil boring and description will suffice to identify and determine the depth to major

The. potential uses of Ground Penetrating Radar are still being tested and discovered under varying soil types and conditions in different regions of the United States. Ground Penetrating Radar has been applied to archaeological, engineering, geologic, sedimentation and soil investigations in Alabama, Florida, Louisiana, Minnesota, Oklahoma and Tennessee. Ten states have been selected by the Soil Conservation Service National Office for Ground Penetrating Radar field work during FY-84. Three states, Minnesota, Missouri, and Ohio have been selected from the Midwest.

G.W. Schellentrager
Soil Scientist (GPR)
Soil Conservation Service
Federal Building
401 S.E. First Avenue
Gainsville, FL 32602

A VIEWPOINT

Richard W. Arnold
Director, Soil Survey Division

In the National Cooperative Soil Survey (NCSS) many of our principles and standards are given in the Soil Survey Manual and others are in Soil Taxonomy. These standards should be continually tested, evaluated and updated as necessary.

The National Soils Handbook (NSH) is a collection of and guidelines to help us meet our goals. It is not a set of rules and regulations. A primary goal of NCSS is to obtain and provide high quality soil information. Scientific integrity is the cornerstone of high quality soil information.

We all have important responsibilities in the soil survey. Let's do our best--think, act, reason, achieve--don't hide behind the NSH. Use it as a helpful tool, not as a mean to control methods, or people, or our soil survey.

Let me highlight some items that enable us to conduct soil surveys and stand up for their quality. They are:

1. An understanding of landforms, at least locally.

2. An ability to accurately locate and delineate landscape components on base maps (airphotos. Landsat, and others).

These two give us delineated landscape segements that are repeatable and consistently recognizable. It also provides us with areas that are not repeatable and must be examined further.

3. An ability to develop and apply standards of observation and measurement in describing soil profiles and landscape features.

4. An ability to relate soil observations to landscape segment observations and establish working hypotheses about the empirically related phenomena.

5. An application of the working models in the design map units and consistent ways o identify, name, and describe the resulting soil map units.

6. An ability to relate soil-related behavior such as yields or slope, stability, to soil properties and to the landscape segments where those properties are present. This is the major arena of soil interpretations; there are many kinds for many purposes.

7. A knowledge and where-with-all to test, evaluate and state quantitatively the level of quality, the degree of accuracy, and the reliability with which we know and understand each of the above items.

The following statements have been gleaned from the book "In Search for Excellence" by T. J. Peters and R. H. Waterman. Jr. You can decide if any of them refer to our situation.

"Experimentation is the fundamental tool of science; if we experiment successfully, by definition, we will make many mistakes."

"There is a major difference between scientific work as it appears in print and the actual course of inquiry. Books on scientific methods present ideal patterns, but these tidy, normative patterns do not reproduce the typically untidy, opportunistic adaptations that scientists make."

"A Noble laureate in immunology...once said, "It is no use looking to scientific papers for they do not merely conceal, but actively misrepresent, the reasoning which goes into the work they describe."

"Anti-experimentation leads inevitably to over complexity and inflexibility. Caution and paralysis induced-by-analysis lead to an anti-experimentation bias. To produce super products, hopelessly complicated and ultimately unworkable management structures are required."

"For example, it is assumed that if objectives and critical paths to these objectives are defined clearly, people will tend to cooperate to achieve those objectives according to the best schedules they could devise. All too soon the paperwork becomes an end in itself--that is, planning and progress reporting take over--experimentation is lost."

Peters and Waterman noted that excellent companies respond to complexity with fluidity which is the administrative version of experimentation.

In comparing the rational with the informal management process, they observed that the rational process of management uses these verbs--analyze. plan, tell, specify, and check whereas the informal management process uses these verbs--interact, test, try, fail, stay in touch, learn, shift direction, adapt, modify and see.

"It turns out that the informal control through regular casual communication is actually much tighter than rule by numbers. which can be avoided or evaded."

"Top performers create a broad uplifting shared culture. a coherent framework within which charged-up people search for appropriate adaptations. This relates to their ability to create a sense of highly valued purpose. Such purpose invariably emanates from love of product, providing top quality services, and honoring innovation and contribution from all."

Surely these thoughts can nurture us as we continue to grow in strength, experience, and wisdom. Let them be said of us--the National Cooperative Soil survey.

A FARMER LOOKS AT THE SOIL SURVEY

By Jim Lukens

I want to discuss briefly with you my experiences with the soil survey report as they relate to farming. My education about the soil began long before I met a survey report. I learned early to appreciate the soil and the responsibility of soil stewardship from my dad as I worked on the farm as a youth. I gained a working knowledge of soil properties of our soils from the seat of a tractor.

Eventually I developed a love of the soil, an attachment encouraged by rehetoric of organic-farming proponents. I was first introduced to the soil survey by Vernon Hamilton, the soil scientist who was mapping my home county. When I asked him about the soils on my farm and saw his eyes instantly light up, I got a hint that the survey was a labor of love. I learned more about both the love and the labor when I had a course under Dr. O. W. Bidwell at Kansas State. I learned better how to interpret the survey report by examining the relationships between soil physical and chemical properties and the way the soil responded to tillage. Dr. Bidwell also made some sense out of the taxonomy by demonstrating how soils occur in sequences in the landscape.

From the survey report I was able to better see the soil sequences and physical differences among the soils I had tilled as a boy. In terms of how the soils responded to management practices, however, the survey seemed to provide little more than verification of what I had already learned from experience. It didn't seem to add much to what I had learned from riding around the fields on a tractor. I want to mention several ways survey reports are helpful to farmers who use them, and several ways in which I feel they fall short of their potential.

As I mentioned, these comments are based upon my experience and observations, not on a scientifically designed survey of farmers. It seems clear, however, that when one considers how farmers will directly use the report, he should first recognize that some farmers can be ignored--they won't use the printed report no matter what. It is not that they aren't interested or that they can't understand, but they are not oriented toward the printed word. The farmers I am considering are the readers.

Almost 15 years ago my wife and I purchased a small farm in eastern Kansas, 200 miles from the soils I grew up on. I wasn't familiar with soil surveys then, but had I been, I could have used the report to help choose a piece of land to purchase. The general information about the county would have told me about the climate and typical crops grown in the area.

By using the soil map of the land in question, I could have determined the soils present, their approximate acreages, typical uses, limitations, and potentials. Without even setting foot on the property, I could have evaluated it in terms of cropland vs. pasture, dryland vs. irrigated, and projected the ways in which I would use it. I could have estimated the property value either by projecting potential profit based on average yields found in the survey report, or by comparing it to land with similar soils which had recently soil in the community. The survey report would also have helped me make an evaluation of the care the land had received in the past. Signs of erosion in the cropland and plant species shifts in native pasture are clues to past management practices.

A soil survey report can also be very helpful in making long-term decisions concerning land use. Such decisions include whether the land should be used as pasture or cropland, whether or not irrigation development would be appropriate, and the need for the ease of construction of conservation structures. The survey report is also of considerable help in choosing sites for construction of buildings, septic tank fields, lagoons, ponds, and on-farm roads. It contains easily understood information on potential for growing trees for windbreaks and for the development of wildlife habitat.

The soil survey report is less useful to a fanner in making short-term management decisions. The inherent characteristics of the soil determine the ways in which it should be handled, but the implications are not discussed in any detail in the report. These short-term decisions include the following: What tillage system and tools should I use? When should I carry out tillage operations? How deep should I till? Which fields are going to dry out or warm up first? Which fields are going to be more (or less) tolerant of field operations when it is wet? What crop species or variety should I choose? When should I plant? How deep should seeds be placed? What seeding rate is appropriate? What kinds and what amounts of fertilizer should I apply? What problems with herbicides am I likely to experience?

The answers to these questions are obviously influenced by many factors besides the soil, including weather, cropping history, and the economic situation. Many characteristics and tendencies such as water-holding capacity, infiltration rate, surface crusting, compaction, plow-pan development, and herbicide tie-up are predictable and can be analyzed in tens of day-to-day management decisions. To be of help to most farmers, the implications of inherent soil characteristics need to be pointed out.

The form in which information is presented can encourage use by farmers. To persons unaccustomed to tables and charts, narrative accounts are more friendly, especially if care is taken to make them easily understood and non-technical. The vocabulary used is very important. I suggest that information written especially for farmers be identified as such, perhaps in the table of contents. It does little good to write a mapping unit description that is easily understood by a fanner if the farmer finds the technical series description first and gets lost in its language.

While the survey report has to have as its first priority the transfer of information, I feel some effort to convey the emotional attachment would also be appropriate. The report should reveal the spark I saw in the eyes of the soil scientist when I asked him about my soil. If a farmer can become enthused about the particular soils on the farm and learn their names and "pedigrees", he/she will be more observant of its condition and sensitive to its needs. An emotional attachment to the soil can only encourage greater soil conservation efforts. No one is better able to foster that attachment than the dedicated soil scientists of the SCS.

Northeast Soil Survey Activities

Presented by

Or. James C. Baker[1]

A regional conference representative exchange was started two years ago, and my presence at your meeting is a result of that action. At that time we (in the Northeast) sent a representative to the Northcentral, Southern and Western Cooperative Soil Survey conferences, and had a representative from the Southern (Oave Lietzke - Univ. of Tenn.) and the Northcentral (Ivan Jansen - Univ. of Ill.) regions attend our conference in Ithaca, NY. This year we will have a representative at the joint Southern and Western (Ed Ciolkosz) and at your conference, and we have been notified that Neil Smeck (Northcentral-Ohio State Univ.) and LeRoy Daugherty (Western-NM State Univ.) will be joining us June 10-15 in Amherst, Massachusetts,for our conference.

At our last conference in Ithaca the membership approved the establishment of a "Northeast Cooperative Soil Survey Newsletter", with the conference steering committee acting as its editorial board. The conference also determined that the cost of the newsletter would be born by a conference registration fee and the newsletter would be put out at least once a year. The newsletter is being distributed in the Northeast and on a limited basis in the other regions.

Also, at our last conference it was suggested that we need a better dialogue with the Northeast Experimental Stations. As a result of this discussion a Northeast Experiment Station Regional Committee on Soil Survey (NEC-50) has been formed. This committee will meet annually and every other year it will meet at the NE Cooperative Soil Survey Conference. The committee presently is compiling a soil survey research needs list for the NE and a listing of soil pedon data for the NE. In additon, under the auspices of the NEC-50 committee a NE graduate student soils field trip has been established. The field trip will be an annual summer trip which will cycle from the northern to the southern part of the region every other year.

Our conference this year in Amherst will have the following committees: 1) Regional Erosion-Productivity Studies, 2) Soil Survey Training Course, 3) Role of Soil Series in Taxonomy, and 4) Interpretations of NE General Soils Map. In addition, a large number of speakers and demonstrations will focus in on the computerization of soil survey information.

Our soils map and Bulletin for the Northeast have just been published. A manuscript derived from the data of our Northcast soil characterization study has been accepted by Soil Science for publication. Unfortunately, because of an apparent large backlog of manuscripts, the paper will not be published until the second half of 1985.

Our conference is, of course, like yours a part of the soil mapping activities of the region. The Northeast is much different than your regions. Our 13 states (CT,

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[1]Assistant Professor and Coordinator of Virginia Tech Soil Survey, Agronomy Department, VPI & SU, Blacksburg, Virginia 24061.

DE, ME, MD, MA, NH,.NJ, NY, PA, RI, VT, VA, AND WV) encompass an area that is about 154,000,000 acres which is about 7% of the land area of the 50 United States. Being somewhat smaller than your regions, our soil mapping is progressing rapidly. The Northeast is 73% mapped and about 50% of the mapping is published. We have five states (Maryland, Delaware, Connecticut, New Jersey, and Rhode Island) and the District of Columbia in which the mapping is finished. One additional state is almost finished (Pennsylvania about 98% complete), and the remaining states vary from 82% (Massachusetts) to 44% (Maine) complete. Thus the soil survey in the Northeast is rapidly moving into an era of using soils information as opposed to gathering it (soil mapping). This offers many challenges for us today and in the future.

Again, the purpose of my presence here is to help open better communication between the north-central and the northeast regions. In particular, I would like to propose the following:

1) We continue with an exchange of conference representatives in the future.
2) We explore the possibility of regional newsletters which could be exchanged from region to region.
3) We explore the possibility of joint regional conferences.

NORTH CENTRAL REGION SOIL SURVEY WORK PLANNING CONFERENCE

Committee 1 - Improving Soil Survey Techniques and Modernizing Soil Surveys

Tuesday, April 3, 1984 8:30 - 10:30 am

Agenda

Charge 1 - Review national guidelines for evaluating earlier published soil surveys and determining need for updating.

8:30 - 8:45 The Indiana Experience. Leon B. Davis, Assistant State State Soil Scientist, Soil Conservation Service

8:45 - 9:10 Discussion

Charge 2 - Prepare guidelines for coordination of habitat types and map units and an outline for presenting the information in map unit description.

9:10 - 9:25 Guidelines for Coordinating Mapping Units and Habitat-Types. John Kotar, Assistant Professor, Department of Forestry, Michigan Technological University

9:25 - 9:50 Discussion

Charge 3 - Prepare guidelines for use and management part of map unit descriptions that are used for range.

9:50 - 10:05 The Range Section of Map Unit Descriptions in Published Soil Surveys. Rod Harner, Midwest National Technical Center, U.S.D.A., S.C.S.

10:05 - 10:30 Discussion

Committee 1

Charge 1

Review national guidelines for evaluating earlier published soil surveys and determining need for updating.

National Issue Committee 3, Update Strategy has developed guidelines for evaluating earlier published soil surveys (see pages 47-60, Proceedings of the National Technical Work Planning Conference of the Cooperative Soil Survey. Washington, D.C., March 28-April 1, 1983). The purpose of this charge is to review and test these guidelines. It needs to be emphasized that updating can be done many ways. The following are some ideas to consider: (1) remapping (complete or partial), (2) recorrelation, (3) updated interpretations, (4) new interpretations. I am sure there are others.

A. Subject discussed in National Soils Handbook, Section 601.03, USDA SCS National Bulletin No. 430-4-4 and pages 47-60, Proceedings of the National Technical Work Planning Conference of the Cooperative Soil Survey, Washington, D.C., March 28-April 1, 1983. Soil Survey Evaluation Worksheets are available through SCS channels.

B. Pre-evaluation planning is necessary 6-9 months before actual soil survey evaluation begins. A committee of SCS, University and state cooperators should meet to discuss update needs and priorities.

C. Input from local users pertaining to their soil information needs are a necessity. This can be accomplished by a letter campaign or local meeting, or both.

D. Preliminary evaluation should be done by a Soil Scientist familiar with the county and the local D.C. This evaluation should identify areas in the county that need detailed evaluation by field checking and transects.

E. Studies in Wisconsin showed that interpretations and map unit description are the weakest parts of older soil surveys.

F. Once the evaluation worksheet has been completed a priority rating for updating soil surveys is necessary. (p. 60, Proceedings of the National Technical Work Planning Conference of the Cooperative Soil Survey. Washington, D.C., March 28-April 1, 1983).

Committee 1
Charge 1 continued

G. Present guidelines do an adequate job on the technical evaluation of older soil surveys, but guidelines for the financing of updating or remapping seem to be non-existant.

H. Brochures such as "Modernizing Soil Surveys" available from the Cooperative Extension Service, Ohio State University are helpful in providing information to interested parties about the reasons for updating older soil surveys.

I. See report of Committee 4, Charge 2 for a discussion on format of an updated soil survey and how an updated soil survey should be distributed.

Recommendations for Charge 1

1. The national guidelines for evaluating earlier published soil surveys have -been substantially reviewed by previous regional and national committees. For this reason Charge 1 should be dropped from Committee 1.

Committee 1

Charge 2

Prepare guidelines for coordination of habitat types and map units and an outline for presenting the information in map unit description.

Darwin Hoeft, USFS, Custer, South Dakota, has made the recommendation that soil series be linked to habitat types (see page 54 of Proceedings of North Central Regional Work Planning Conference for 1982). Habitat types are being used by the USFS at least in some areas of Michigan and Wisconsin, but there is not complete agreement on their use. A standard definition of habitat type needs to be prepared if one does not already exist. Guidelines are needed for coordinating habitat types and map units. Guidelines should be developed for presenting this information in the published soil surveys.

A. Studies in Michigan by John Kotar have shown a relationship between habitat types and soil map units. (See attachment 1 for background on habitat types). This relationship is similar to the range site - soil map unit relatidnship used in the western part of the region.

B. In dominantly forested areas where a Vegetative Habitat Classification System has been or is being developed, Habitat types should be recognized as credible indicators of vegetative response, and integrated into the soil survey. They should be integrated into map unit design as needed to help interpret vegetative response according to the objectives specified for the soil survey.

In dominantly forested areas where Habitat types per se have not been developed, information on natural vegetative communities should be integrated into the soil survey to a degree commensurate with the knowledge available, and the objectives of the soil survey.

C. The published soil survey, for dominantly forested areas where Habitat types have been developed, should contain a chapter on Habitat types. We would suggest that this chapter be located in the text just before the map unit descriptions. The chapter should include a list of the Habitat types that occur in the survey area along with a brief description of each, It should refer the reader to one or more other sources for additional information. (For soil survey areas in Northern Wisconsin and the Upper Penninsula of Michigan, the primary reference would be the "Habitat Classification Field Guide--Northern Lake States Region." Coffman, Michael S; Edward Alynak; John Kotar; James E. Ferris, 1982. HABITAT CLASSIFICATION FIELD GUIDE, NORTHERN LAKE STATES, second printing, 1983).

The map unit descriptions (both general and detailed) should include mention of the Habitat types associated with each unit, including their relative proportions.

Committee 1
Charge 2 continued

D. Published soil surveys of dominantly forested areas where Habitat types have not been developed should still contain information on natural vegetative communities. The depth of this information will necessarily vary depending on the extent of knowledge available. As a minimum a linkage of soil mapping units with their associated vegetative communities should be made.

E. Dialogue at the regional and national levels is needed pertaining to how habitat types fit into soil correlation and how to present the information in published soil survey reports. (See attachments 2, 3, 4 for examples of proposed soil survey inclusion pertaining to habitat types).

F. Guidelines are needed to help in correlating soil map units as evolved via an ecological classification system such as used by the U.S. Forest Service.

Recommendations for charge 2

Many questions remain unanswered ie; Why should habitat types be included in soil survey reports?, Under what conditions should habitat types be included in soil survey reports?, How should habitat types be included in soil survey reports?

The committee encourages North Central Region Cooperative Soil Survey envolvement in habitat type and soil relationship studies.

The committee recommends that charge 2 be continued focusing on the above mentioned questions. It is also recommended that examples of map unit descriptions containing information on habitat types and the guidelines used in developing them be distributed and discussed at the next conference.

Committee 1

Charge 3

Prepare guidelines for use and management part of map unit descriptions that are used for range.

Permission has been received to use range site descriptions in the published soil surveys, but we still have the option of putting all the information in the map unit description. We need to receive input from range conservationists and other users on the kinds of management statements needed for range. Also, we need to prepare guidelines for both of the above options. It is suggested you contact Rod Harner for examples of the options for presenting the range information.

A. There are three approved formats for handling the range portion of the manuscript. They are as follows:

1. The first format is that which we are presently using. This uses table C to list the composition and the productivity of the range site for given map units. The management statements are included in the range paragraph in the map unit description. The consequence of overgrazing is also stated there, and the kind of vegetation resulting from overgrazing is cited. The range site may be listed at the end of the map unit description.

2. The second format uses an abbreviated table C, which is designated as Cl. This table shows the map unit symbol, the soil name, the range site, and the productivity for three levels. A brief description of the vegetative cover is given in the range paragraph to the map unit, and management concerns for the unit are cited. Included in this paragraph are statements concerning the consequences of overgrazing. The use of table Cl and this format for the range paragraph in the map unit description is approved and table Cl is being formatted.

Example Format No. 2. The potential plant community is mostly tall and mid grasses dominated by little bluestem and by lesser amounts of big bluestem, Indiangrass, and switchgrass. Under continuous heavy grazing by cattle, these plants decrease in abundance and sideoats grama, tall dropseed, blue grama, hairy grama, and buffalograss increase. If heavy grazing continues for many years, less desirable plants replace the tall and mid grasses.

Note: The range site may be listed at the end of the map unit.

3. The third format has the entire range productivity, composition, and management statements contained in the range part of the map unit description. A table is not used in this alternative. The writeup is the same as that described in Format 2, except for the addition of the productivity, which is added in an extra sentence.

Example Format No. 3. The potential plant community is mostly tall and mid grasses dominated by little bluestem and by lesser amounts of big bluestem, Indiangrass, and switchgrass. Under continuous heavygrazing by cattle, these plants decrease in abundance and sideoats grama, tall dropseed, blue grama, hairy grama, and buffalograss increase. If heavy grazing continues for many years, less desirable plants replace the tall and mid grasses. The total annual production is about 2,800 pounds per acre of air-dry forage during favorable years, 2,100 pounds for average years, and 1,600 pounds for unfavorable years.

The range site should be added at the end of the map unit.

B. One of the continuing problems in range sections has been the use of undefined jargon (planned grazing system, proper grazing use, etc.). If writers insist upon using it, they should first carefully explain the terms in the general "Rangeland" section. Next, they should prepare a brief definition of such terms and add them to the glossary. It is probably easier for the general public if jargon is avoided altogether.

Recommendations for charge 3

A. The committee recommends that charge 3 be dropped from committee 1. The NTC has made available the approved options for the range portion of the manuscript. Individual states may select the option that suits their needs.

B. The committee recommends that a charge be initiated similar to charge 3 but pertaining to windbreak suitability groups. It should deal with the simplification of windbreak tables (see attachment 5) and the windbreak paragraph in the map unit description.

ATTENDANCE DURING COMMITTEE 1 DISCUSSION

April 3, 1984 8:30 - 10:30 am

* Committee Member

Name	Agency	Location
Rod Harner	SCS	Lincoln, NE
Miles Smalley	SCS	Huron, SD
Alexander Ritchie	ODNR	Columbus, OH
Larry Tornes	SCS	Columbus, OH
Sy Ekart*	SCS	Bismarck, ND
Westal W. Fuchs	SCS	Temple, TX
Jim Culver*	SCS	Lincoln, NE
John R. Nixon	SCS	Des Moines, IA
Fred Minzenmayer	SCS	Salina, KS
John Hickman	CES	Kansas State Univ.
Paul Minor*	SCS	Columbia, MO
Bill Broderson	SCS	Columbia, MO
Jake Jacobson	SCS	Ft. Worth, TX
John I. Brubacher*	SCS	Madison, WI
Milo I. Harpstead	UWSP	Stevens Point, WI
Walt Russell*	USFS	Milwaukee, WI
Dick Base*	SCS	Lincoln, NE
Bob Pollock	SCS	Lincoln, NE
Don Last	CES/UW-SP	Stevens Point, WI
Gerald Miller	IOWA STATE UNIV.	Ames, IA
George W. Hudelson*	SCS	Madison, WI
John Kotar*	MICH TECH UNIV.	Houghton, MI
Christine Lietzau*	MICH DEPT OF AGRI.	Lansing, MI
Ted M. Zobeck	OHIO STATE UNIV.	Columbus, OH
Douglas B. Oelmann	SCS	Des Moines, IA
Chuck Fisher*	SCS	East Lansing, MI
Dick Arnold	SCS	Washington D.C.
James C. Baker	VIP & SU (ne rep)	Blacksburg, VA

ATTACHMENT 1

Transcript of John Kotar's presentation to Committee 1 as recorded by George W. Hudelson, Vice Chairman, Committee 1.

GUIDELINES FOR COORDINATING MAPPING UNITS AND HABITAT TYPES.

John Kotar, Assistant Professor, Department of Forestry, Michigan Technological University, Houghton, Michigan.

I am a forester, actually a forest ecologist. I have been dealing with and trying to understand forests and I can easily say, I have never been far away from the soil. It has always been an intricate part of my involvement which some of you will say is not the case with all foresters. I guess I have had good training, in fact Milo Harpstead here was my professor and I haven't seen him in many, many years. He brought me into the science of soils which I have pursued ever since in conjunction with ecology.

When I was asked to appear here and talk to you briefly about the possibility of the use of the so-called habitat types in soil surveys, I really didn't know where to start. I knew there was going to be a problem. There is never enough time to get the whole idea across. I will try to spend a few minutes to give you a little background, perhaps philosophical background, as to where we are coming from on this. Some of you, perhaps, are quite familiar with the habitat types concept and system but some of you have not dealt with it very much.

First of all, the habitat type concept is something that would not come naturally to soil survey people dealing primarily in agricultural areas. You have had tremendous experience in these areas with the work that had to be done and has been done with the soil resource.

I can see through all this experience that you have developed a system, mapping and surveys included, that is extremely useful for a variety of applications. Farmers, for example, can choose crops from experience; they have many, many rotations that they can deal with and they have a good idea whether corn or soybeans will grow here. Foresters do not have this benefit. I want to emphasize this fact how foresters are different.

Trees grow on the soil; we rely on a soil and we need to know soil information. Why aren't traditional SCS soil surveys just as applicable to forestry as they are for agricultural or other uses? The reasons are very, very simple. The foresters are still dealing with native species. They really don't have a menu of species to deal with for reforestation. They try to manage what grows there now, at least the native species. Very few places use the exotic species. Certainly the Lake States, the East, and the Pacific Northwest use native species.

They are also just beginning with plantations. Foresters have not even established a crop. We have been cutting, sometimes collectively, sometimes not, but establishment of plantation on a large scale, other than in the South, is not going on now. The West, in the last 10 years has established douglas fir reforestation and the Lake States, primarily red pine and a few other species.

Foresters do not have anything to look back on, such as agriculture, to see how their forests have done, how any of the species have done on any of the sites. The relationship between soil surveys and forest management practices just doesn't exist.

So what do foresters do? They primarily rely on natural vegetation. The trees are associated with other vegetation, dozens and dozens of species, and they tell them (foresters) something about what they can expect in terms of management for that particular forest. So we arrive at a concept of a habitat type. I will define it briefly and then move on and show you how this idea can be sort of reconciliated with the SCS approach.

Habitat type is really nothing more than a type of land, a piece of landscape if you will, that is capable of supporting a particular kind of climax association. It all hinges on that, whether the climax association is there now or not does not matter. In fact, most cases it is not there. The idea is that it could be there and it identifies that type as being capable of producing certain kinds of forest.

If, in a given area we can determine for a larger landscape or region what type of climax association existed then and where, then we can start managing forests based on this kind of information.

This brings us to the Question. Should habitat types be included in soil surveys; or put it another way, why should habitat types be included? For one thing, habitat types are related to soil, as well as climate and land forms. They definitely have something in common. When we look into them in depth, we find there is tremendous relationships between these climax associations, particularly in the Lake States, They are there, they differ fron one acre to another, basically because of soil. It is certainly not due to elevation or macro climatic differences. The soil is the driving factor.

Some properties of a site are more easily detected through this vegetation than trying to interpret the morphological properties of the soil, such as we do in SCS. However, the soil should continue to be mapped in these forested regions according to their morphological characteristics, but where possible have some information included as to their recognized habitat type.

Under what conditions or circumstances could habitat types be used in SCS surveys? Only in those areas where botonists, ecologists, foresters, or whoever have delineated such types where vegetation has been studied, described, and published as vegetation units. All we have to do then is relate these units to your soil mapping. If we can do that, we are working hand-in-hand.

For example, mapping unit 15B is associated with Acer-Tsuga-Dryopteris. It will associate with it 80 percent of the time, or 10 percent of the time it will be associated with some other plant association. Just knowing that for the mapping unit will open the window into all this information that is already gathered in the region for that particular habitat type.

At this point I will show some slides and I will present a few more things. I hope you have some questions. I showed some of these slides at Madison a week or so ago at a symposium on land classification.

Here I am just going to identify a habitat type graphically for some of you who have not been exposed to this. These are two different types on two different kinds of soil. Without knowing what is underneath, I could assess the vegetation if there were an undisturbed forest stand, and see that, in addition to the tree species, there is a combination of understory species that is different on each site.

The habitat types rely primarily, for identification purposes, on the understory vegetation because when you clear-cut or otherwise disturb the site, the trees are gone and in the natural replacement or successional pattern the trees will not be there immediately. We would not be able to detect the difference based on trees alone. We look to the understory vegetation; it is still there and it is different. This vegetation is related to this kind of climax community and that vegetation to that climax community. As they revegetate, the forester sees only aspen but by observing the understory species he can see that there are differences as to what the productivity will be and the climax type. We do not have to manage towards the climax type, but it (habitat species) tells us a great deal about the successional stages that the site will go through.

Different kinds of cover types (e.g., spruce-fir or maple-beech) occur on other types of sites and the forester cannot distinguish between the productivity relationships unless he knows the habitat types (understory species) which will indicate what can happen on this site.

There are 22 habitat types so far in Michigan and Wisconsin. For example, how does red pine produce on these different habitat types? We can see (from chart) that there are ranges among these habitat types. We can see that in some types red pine productivity is the same as the present maple-basswood and there would be no reason to convert to red pine. This kind of information is important to forest managers and they cannot get this directly from interpretation of soil properties alone.

Habitat types are not being mapped. No one is going to map the whole United States or even Michigan or Wisconsin. It just cannot be done. No agency exists to do it; the manpower is just not there. We need to associate these types with something that is mappable, such as soil, physiography, or landform. We want to associate with some agency doing this kind of mapping. We want to "piggy-back" with them in an area where forestry is very important.

We have done some pilot studies in these areas, some national forests and with SCS in Michigan in several counties. We have gotten interesting results. Baraga County, Michigan was our first attempt to see if there was a relationship between a mapping unit or perhaps soil series and some habitat type. We got these results (graphs on slide). Soil mapping unit and various habitat types found by random sampling of mapping units on several field sheets.

We picked several sites and went out on the ground and using our field guide identified the habitat types and their frequency of distribution. This so-called ADV predominates although we have several others (6 types). The ADV is 70 percent and another type (closely related) is 20 percent. If combined, I have accounted for about 90 percent and therefore this particular soil mapping unit associates very heavily with this ADV.

We went into Dickinson and Menominee Counties in Michigan and used transects this time. Transects were randomly put in and we had a soil scientist and ecologist identify the soil and habitat type at points along the transect. Here Emmet unit'is associated with AVO habitat type. We should look at the mapping unit however and its inclusions as well so we know what we can expect.

Question: What is the size of area for identifying habitat types?

Answer -

For identification purposes about .1 or .5 of an acre.

Question: Do you identify all plants?

Answer -

No, we have a field guide which identifies those species that have diagnostic characteristics. We do not need to identify all of the species present. Maybe 3 or 4 is all that need be identified. Succession does matter but those (species) that are members of the climax species will be there in relative proportions to each other. The relative proportion is fairly constant.

Question: Do you have a set number of habitat types?

Answer -

Yes. Right now we have 22 habitat types. We have a key to use.

Question: What is the regional scale?

Answer -

The key is good for one-half of the upper peninsula of Michigan and the northern one-third of Wisconsin, an area of about 100 x 200 miles. It is a small area but for adjacent areas there is modification to the present key or a new key and new descriptions. In new areas of Wisconsin, we will delineate new habitat types. This summer we have two or three projects lined up for Wisconsin.

Here is an interesting situation with the Pemene soil in the upper peninsula of Michigan in Dickinson and Menominee counties. The Pemene soil was mapped on two different land forms and the habitat types did not support the way the soil was mapped. The feeling is that the habitat types tells us there is something quite different about these soils. Morphologically, there appears to be little difference in these soils on these two landforms. The glacial landform map shows the areas to be an end moraine (calcareous) and a ground moraine,

Another mapped area had 30-40 mapping units but only 8 habitat types were identified. We were able to lump this many units into 7 categories based on habitat types alone. I am not saying that it was a mistake to map 30-40 units because for other purposes of use the 30-40 mapping units were needed (e.g. operability).

Question: Are you advocating this system as a supplement to soil survey?

Answer -

Yes, as a supplement. Three alternatives are usually suggested. One, of course, is the ecological classification system of the Forest Service. You make mapping units by taking into account everything, landform, soil, and associations. You make the mapping unit and go out and map them. It is done like that in the Ottawa National Forest. Of course, they didn't have any history of soil mapping or anything else. They were able to start from scratch.

In another area, for no other reason than historic, it cannot be done. Everybody has some kind of system already. It does not make much sense to wipe it out and start from scratch. So I really think that once it is built into it, it would be an addition to or supplement in most all cases.

Question: What about its relationship to the series or phases of series without inclusions?

Answer -

Where we sampled in the purist units we could find, that were primarily of one soil series, we got very good results.

I am not saying, of course, that one soil series will be associated with one habitat type everywhere. We all know that. Some of the climatic changes are not picked up by the soil development but are picked up by current vegetation. We can phase those kinds of things.

In fact we are going beyond this. The ultimate goal of forest land classification would be to come up with subunits, subregions, whatever, some kind of hierarchical order including climatological breakdown. In fact, we are just now getting some work on that too. People are working on climatic zones. It is another step forward.

For example, when I have these particular types of moraines giving us one type of parent material and associated soil, but the climate breaks down somewhere in between and the habitat types will reflect that too. So, there is no sense putting the entire end moraine, we have in eastern Wisconsin even though the soils are the same, into one unit for our forest planning purposes, we will have a climatological break somewhere.

Ultimately the way foresters are visualizing a system of classification would be like that based on all of these things. The soil surveys provide the vehicle for fishing out these habitat types and where they have to be. Right now we know conceptually where they are. For the 22 habitat types we are talking about, I do not find new ones in that region. We just deal with this pool of habitat types.

Comment from member of audience:

Soil scientists enjoy using the habitat types once they become acquainted with them. They can map with greater confidence and at a greater rate. They can do a better job.

Speaker's comment:

It does really work together. There is one thing I could emphasize; you cannot separate them. These plants are growing in the soil and when I am looking at plants, which I know better, the first thing I do when I walk into a stand if I do not have a shovel, is kick the soil or grub it with my hands. I look at the soil and it tells me many times what to expect but sometimes I am surprised and the answer lies someplace else, perhaps deeper in the soil.

Question: Are these indicator species in a symbiotic relationship with the trees under which they grow?

Answer -

No, it does not imply any of that at all. The understory species have a common ecological requirement and that is why they are there.

Question: For example, hemlock will produce an acid condition and you have certain indicator species which have a very acid pH preference so you would expect them to be found near hemlock and there are those that have less acid preference and would not necessarily be there. Is it related to what the tree can bring up from within the soil and what is deposited on the surface in leaf fall?

Answer -

If the tree is creating the physical site condition, contributing to acidity, well then, the tree is an important factory to the understory species, it is not necessarily totally the soil.

ATTACHMENT 2

SOIL SURVEY IDENTIFICATION LEGEND

OTTAWA NATIONAL. FOREST

October 1983

Habitat Types

The habitat type is made a part of the Ecological Landtype Phase Units. These are abreviated on the following identification legend.

AC	Alnus-Carex
AOC	[illegible]-Osmorhiza-Caulophyllum

AulophylumTm (AOC)Tj7.245614.839996.74561 1 0 0 156155 Tf ET q 65.7600006 cm I /W 199 /H 27 /BPC 1 /CS /G /D [1

ATTACHMENT 3

Soil Survey Identification Legend - 4
Ottawa National Forest

Note: Total of 20 LTA's, a separate legend for each.

Landtype Association (LTA #2 - Terminal moraine (Winegar moraine)

ELTP Symbol	ELTP Mapping Unit Name
35	Alfic Haplaquods, coarse-loamy (TMC and TMC-D)
36	Histic Humaquepts, moderately coarse to moderately fine (FI and TTS)
37B	Typic Fragiboralf (TMC-D) - Entic Haplaquod (TMC) - Histic Humaquept (TMC) - Borosaprist (TTS), 0 to 6 percent slopes.
38B	Typic Fragiboralf, coarse-loamy, 0 to 6 percent slopes (ATD)
38C	Typic Fragiboralf, coarse-loamy, 6 to 18 percent slopes (ATD)
38D	Typic Fragiboralf, coarse-loamy, 18 to 35 percent slopes (ATD)
40	Borohemist; dysic (PCS)
41	Borohemist, euic (TTS)
42	Histic Humaquept, floodplain (AC)
43B	Entic Haplorthod, sandy, mixed, frigid, 0 to 6 percent slopes (TM)
43c	Entic Haplorthod, sandy, mixed, frigid, 6 to 18 percent slopes (TM)
43D	Entic Haplorthod, sandy, mixed, frigid, 18 to 35 percent slopes (TM)
448	Entic Haplorthod, coarse-loamy - Typic Haplorthod, sandy, 0 to 6 percent slopes (ATD)
44c	Entic Haplorthod, coarse-loamy - Typic Haplorthod, sandy, 6 to 25 percent slopes (ATD)
44D	Entic Haplorthod, coarse-loamy - Typic Haplorthod, sandy, 25 to 55 percent slopes (ATD)
45B	Typic Haplorthod, sandy, 0 to 6 percent slopes (ATD and TM)

1742B

Soil Survey Identification Legend - 3
Ottawa National Forest

Landtype Association #14A - Glaciofluvial material (Superior lobe)

ELTP Symbol	ELTP Mapping Unit Name
17B	Lode silt loam, 0 to 6 percent slopes (TMV)
17C	Lode silt loam, 6 to 18 percent slopes (TMV)
20R	Borski fine sandy loam, 0 to 6 percent slopes (TMV)
2oc	Borski fine sandy loam, 6 to 18 percent slopes (TMV)
20D	Borski fine sandy loam, 18 to 35 percent slopes(TMV)
21	Histic Humaquepts (TTS)
24	Aquic Dystrochrepts (TMC)
25B	Typic Dystrochrepts, moderately well drained, 0 to 6 percent slopes (TMC and TMV)
27	Borosaprists, euic (TTS or TMC)
28	Borosaprists, dysic (PCS)
29B	Typic Dystrochrepts-Pence association, subirrigated, 0 to 6 percent slopes (TM)
31	Histic Fluvaquents - Borosaprists association (FMC)

ATTACHMENT 4

Proposed for inclusion in the Baraga County Michigan Soil Survey. (About 10 habitat types to be discussed, 2 examples here).

(Draft - Forest Habitat Types)

The Habitat Type information presented in this section is deriveb from the Field Guide Habitat Classification System for the Upper Peninsula of Michigan and Northeast Wisconsin developed by CROFS (Cooperative Research on Forest Soils)(1). The system is based on the concept that plants are found in predictable patterns or communities and these communities reflect differences in site. The Habitat Type(1) system is primarily oriented to forest management. It provides the land manager with estimates of forest productivity, successional patterns, and silvicultural prescriptions.

The Guide To Mapping Units shows the relationships between soil mapping units and Habitat Types in Baraga County. The primary Habitat Type shown is that type which occurs most frequently on that mapping unit. The secondary tiabitat Type is common but is found less frequently.

The Habitat Type descriptions which follow provide brief information on plant species, soils, landforms, present cover types and general silvicultural practices on each type. Climax species and common uncerstory plants are presented. The section on'succession after original logging allows the user to identify the general nature of the cover types which have resulted from the three most common types of past logging. Where information is available, common silvicultural systems used on each type are also presented.

For further information on alternative silvicultural systems, forest productivity, specific woodland management needs, or Habitat Types, the user can refer to the Field Guide[1] or can contact a public or private forester.

(1) Coffman, M.S., E. Alyanak, J. Kotar, and J.F. Ferris. 1983. Field Guide Habitat Classification System for the Upper Peninsula of Michigan and Northeast Wisconsin. CROFS, Michigan Technological University, Houghton, Michigan.

TSUGA-MAIANTHEMUM HABITAT TYPE (TM)

The TM habitat type has a potential climax overstory dominated by eastern hemlock, sugar maple and red maple with yellow birch as an associate. White spruce, balsam fir, white pine, red oak, northern white cedar and basswood may be present. The dominant groundflora includes wild lily-of-the-valley, bracken fern, sedge, starflower and wild sarsaparilla.

In Baraga County, the TM habitat type commonly occurs on somewhat excessively drained to somewhat poorly drained sandy to silty soils on till plains, moraines and outwash plains and on well drained sandy to clayey soils on lake plains.

Succession following logging is presented below for three common situations:

Logged Climax Stands: Seed origin sugar maple/red maple with mixed yellow birch.

Logged Successional Stands: Seed and sprout origin red maple/sugar maple with mixed yellow birch and minor components of red oak, basswood, northern white cedar, white spruce, and balsam fir.

Logged and Burned Stands: Aspen/birch and/or spruce/fir with mixed red/sugar maple. Occasionally red and jack pine.

Possible silvicultural systems for some successional stages are presented below:

Jack Pine, Red Pine, White Spruce: Normally clearcut removing all hardwood. Provisions for competition control may be necessary. The site is planted and thinned at appropriate intervals.

Aspens: Normally clearcut allowing for regeneration by suckering. Not normally thinned.

Red Oak: Typically harvested using the shelterwood method removing as much maple as possible. The stand is thinned at appropriate intervals removing the maple to favor oak.

ATTACHMENT 4 continued

Sugar Maple: Normally harvested using the selection method. Poor quality trees are removed with sawtimber.

ACER-VIOLA-OSMORHIZA HABITAT TYPE (AVO)

The climax overstory of this habitat type is dominated by sugar maple. Basswood, white ash, yellow birch, ironwood, eastern hemlock and American elm may be associates. The dominant groundflora includes yellow, Canadian, or downy violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and twisted stalk.

In Baraga County, the AVO habitat type commonly occurs on well drained and somewhat poorly drained silty and sandy soils on floodplains; on well drained silty and sandy soils on lake plains and outwash plains; on well drained and excessively drained gravelly, sandy and loamy soils on outwash plains, glacial drainageways, and stream terraces; and on well drained silty soils on till plains.

Succession following logging is presented below for three common situations.

Logged Climax Stands: Seed origin sugar maple with small amounts of basswood and/or ironwood.

Logged Successional Stands: Seed and sprout origin sugar maple with some basswood, American elm, and/or ironwood.

Logged and Burned Stands: Mixed aspen/sugar maple with areas of heavy ironwood and/or basswood. Sprouting of sugar maple can be prolific and site can be set back to an understocked brush cover with sedge understory.

Possible silvicultural systems for some successional stages are presented below.

Aspen: Normally clearcut allowing for regeneration by suckering. If the stand is to be managed for sawlogs, a commercial thinning is usually feasible. Sugar maple and poor aspen clones are removed in the thinning.

Sugar Maple: Typically harvested using the selection method. Poor quality trees are removed with the sawtimber.

Red Pine: The stand is clearcut and the site is generally prepared for planting with provisions for proper competition control. The site is planted and thinned at appropriate intervals. (Represents plantation opportunities and is not part of the natural succession.)

ATTACHMENT 5

Campbell County, South Dakota

Note: Species for each group can be expanded to 24 where appropriate.

TABLE 7--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil. Soils or map units not listed are considered unsuited to windbreak and environmental plantings.)

Windbreak Groups and Soil Name and/or Map Symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Windbreak Group 1 1A; 2; 4; 7A; 7B; 17; 18; Grassna part of 21A; 25; 54; [illegible] part of 57A and 57B; and Grassna part 65A.	---	Siberian crabapple, Common chokecherry, Eastern redcedar, Siberian peashrub, American plum, Tatarian honeysuckle, Peking cotoneaster.	Golden willow, Green ash, Ponderosa pine, Black Hills spruce.	---	Plains Cottonwood-
Windbreak Group 2 24; [illegible] part of 71; and 60.	Redosier dogwood, Siberian peashrub, Tatarian honeysuckle, American plum.	Black Hills spruce, Siberian crabapple, Eastern redcedar, Common chokecherry, Lilac.	Green ash-------------	Golden willow---------	Plains cottonwood-
Windbreak Group 3 Williams part of 5; Linton part of 21A; 21B; Linton part of 21C and 22B; 22C; Williams part of 57A and 57B; 57C; 58B; Vida part of 59D; Bryant part of 65B and 65C; Linton part of 65D; 67A, 67B; Bryant part of 68A; 68B; 68C; 74A; and 74B.	---	Russian olive, Eastern redcedar, Tatarian honeysuckle, Common chokecherry, Lilac, Siberian peashrub, American plum.	Green ash, Ponderosa pine, Black Hills spruce, Bur oak, Siberian crabapple.	---	---
Windbreak Group 4 40B; 40C, 41A, 41B; and 41C.	Siberian peashrub, Lilac, American plum, Golden currant.	Russian olive, Eastern redcedar, Rocky Mt. juniper, Common chokecherry.	Siberian elm, Green ash, Ponderosa pine.	---	---
Windbreak Group 5 13A; 13B; 13C; 24A; and 27B.	Tatarian honeysuckle, Lilac, Silver buffaloberry.	Bur oak, Common chokecherry, Siberian crabapple, Eastern redcedar, American plum, Siberian peashrub.	Ponderosa pine, Green ash, Russian olive.	---	---
Windbreak Group 6 34A; 34B; Lehr part of 36B, 57A; and 57B.	---	Green ash, Russian olive, Ponderosa pine, Eastern redcedar, Rocky Mt. juniper, Siberian peashrub.	Siberian elm------------	---	---
Windbreak Group 7 9C, 24C; and 27C.	---	Ponderosa pine, Eastern redcedar, Rocky Mt. juniper.	---	---	---
Windbreak Group 8 [illegible] part of [illegible], 27B, 63B, and 65D.	Eastern redcedar, Tatarian honeysuckle, Siberian peashrub.	Ponderosa pine, Green ash, Rocky Mt. juniper, Russian olive.	Siberian elm------------	---	---
Windbreak Group 9 [illegible] part of 5.	Green ash, Russian olive, Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, Silver buffaloberry.	Siberian elm, Ponderosa pine.	---	---	---

Committee 2

Soil Interpretations
April 3, 1984

Committee Members:

Present at meeting

Alexander Ritchie, Jr. (Chairman)
Gary D. Lene (Vice Chairman)
Wells F. Andrews
James H. Thiele
William D. Broderson
Larry A. Tornes
Jon C. Gerken
Donald D. Patterson
Miles Smalley

Not present at meeting

Raymond T. Diedrich
James L. Anderson
Paul R. Johnson
Carl Trettin
William P. Hostetler
George F. Hall
Robert Darmody

Other individuals participating

Richard Fenwick
Wiley Scott
Wes Tirks
John Nixon
Douglas B. Oelmann
Paul Minor
Edward Bruns
Bruce W. Thompson
Marvin Dixon
Larry Zavesky
Edward Fleming
Kenneth Vogh
Maurice Mausbach
Ivan Jansen
T.E. Fenton
Dick Arnold
Jon Gerken
Christine Lietzau
Walt Russel
Paul Dyke
John Brubacher
Dick Base
Gerald Post
Ronald Kuehl
Leon Davis
Ted Zobeck

Nine out of sixteen committee members were present along with 23 other interested individuals, who discussed the charges presented to the committee.

Charge 1.

The national technical committee on soil-5's will be making a number of recommendations on reformatting of the soil-5 form and an addition of properties and interpretations. A majority of the committee was of the opinion that the soil-5 needs to be reformatted. The committee felt that more flexibility in storage and retrieval was neededinthe soil-5 form. In addition, it was suggested that the soil-5 and official series sheets be separated. The committee would like to relay the following to the national committee:

a. any drafts of a revision of the soil-5 be routed to each state for comment before the 1985 National Work Planning Conference.

b. solid national guidelines be established prior to the addition of any interpretations to the soil-5 form.

'c. a heed be established prior to the addition of soil data to the soil-5 form.

Members of the conunittee suggested that the following data be evaluated for addition to the Soil-5: CEC, $CaC03$ equivalent, SAR, 1/3 and 15 bar water contents, toxic substances, depth to a restrictive layer other than bedrock, natural fertility, organic matter content for cropland and woodlands, and Atterberg limits.

Charge 2.

States were asked to respond to the FCC proposed grouping of soils, based upon surface properties. The committee had mixed reaction to the system. Most members felt that the system provided little additional information that was not readily available in soil survey reports and other public documents for soilsinthe United States. However, the system may have some potential indeveloping countries where soil information is not readily available. The committee suggests that the 1985 national work planning conference establish a committee to develop a more universally adopted system and that the draft be returned to the regions for evaluation by soil scientists and agronomists at the 1986 regional work planning conferences.

Additional Item 1.

It was moved and seconded by Lietzau/Tornes that the limiting properties associated with moderate and severe limitations be included on woodland interpretation tables. Discussion in favor of the motion reflected the importance of providing the user this information. Discussion against the motion cautioned the group against duplication of information found in the map unit description. The motion carried.

Additional Item 2.

The northeastern region has proposed changing the'slope groupings for building site limitations. Slopes associated with slight limitations be changed from 0-8% to 0-15% slope; moderate limitations changed from 8-15% to 15-25% and severe limitations be associated with greater than 25% instead of the current 15% slope. These changes suggested because of the limited excavation costs associated with overcoming this limitation and the numerous developments on 0-15% slopes.

It was moved by Tornes/Davis that the committee go on record not favoring the proposed changesinguidelines for building sites

Additional Item 3.

It was recommended that a committee on soil interpretations be continued.

Respectively submitted by:

Gary D. Lemme

Gary D. Lemme

North-Central Regional Technical
Work Planning Conference
of the
National Cooperative Soil Survey
Manhattan, Kansas
April 2-5, 1984

Summary report
of
Committee 3
Soil-Water Relations
Including Water Movement in Soil Landscapes

Committee 3 consistss of 15 members and 2 advisors. Five members responded by letter to the charges to this committee. Six members and one advisor were present at the meeting. Twenty-eight other people attended. For this report, committee charges and steering committee comments are presented, followed by a review of comments and recommendations received by mail and through discussion at the conference. Finally, a brief summary of comments about the Moisture Control Section and our relations to the NC-109 project is given.

Committe 3 Charges:

1. Determine how soil moisture data presently available can be used.

2. 'Determine needs for additional information on soil moisture.

3. What can the soil survey program do to meet these needs?

The following comments are thoughts form the steering committee for the above charges:

Charge 1:
National Work Planning Conference Standing Committee II, "Moisture in Soils," under the leadership of Robert Grossman has developed a Soil Survey Information Sheet. Suggestions for the application of the information have been made. Use of the water information needs to be tested in making soil interpretations. Do we need to develop this information for key soils? Is there more of a need for this information for some kinds of soils such as irrigated soils, than for others? The bottom line of this charge is how we use this soil moisture information. If we don't have a use for this information, we should not collect it.

Charge 2:
Are there additional needs for soil moisture data that are not presently being gathered or developed? Is there adequate exchange of information between states as data is collected? We do not seem to have any long-term needs identified. Your committee should identify the needs for soil moisture data.

Charge 3:
What can be done as part of the soil survey program (both SCS and University) to collect needed data. Some data can be collected as part of the ongoing soil survey and some may need to be special studies. Data collection could also be a part of our efforts in Basic Soil Services. How can the universities

be more effective in gathering data on moisture in soils? After long-term needs have been identified in charge 2, a plan needs to be developed to collect the data.

Comments and Recommendations

Charge 1:

Comments indicate that a first step would be to make a detailed survey or inventory of the soil moisture information now available. This implies the need to search out the data and gather it together in some central location. Tranformation to some standard base would appear desirable.

Discussion brought out the point that information concerning the depth and direction of the water table (saturated zone) is the type of data that should be collected and summarized in this inventory. This aspect of soil moisture is closely allied with the new NC-109 study. Further discussion indicated that NC-109 should probably be the group to pursue this particular project.

Data can be used to test varous soil moisture models that are now available. Other suggested uses are to apply the data to the documentation of soil water states and to codify the data for soils of large extent.

Committee 3 recommends that available soil moisture information be gathered and summarized with emphasis on depth and duration studies of the saturated zone. The NC-109 project will address the subject. Committee 3 recommends that it (Committee 3) consider proposing a standardized format for. gathering and storing information after results of the NC-109 project become available. Consideration should be given to using this information in models such as EPIC and CREAMS.

Charge 2:

Some of the written comments point out that additional needs for soil moisture data cannot be determined until the extent of available information is known. This indicates that the recommended survey and gathering together of soil moisture data is a first priority. While not stated specifically, it is implicit in the various comments that soil moisture data necessary to fill the gaps in the available data should be collected. Reevaluation of neutron probe data and the collection of more gravimetric data has been suggested.

Some additional kinds of closely related information have been suggested as appropriate and useful in interpreting soil moisture data. Soil parameters such as clay content, bulk density, sand content, etc., are mentioned. Information on soil structure and porosity should be included because of their influence on hydraulic conductivity.

The spatial variability of soil-water states and soil properties related to water within map units is another type of inforamiton that could be developed. Studies of depth and duration of saturation zones is felt to be an urgent need in some areas. These two types of information appear to be closely related to the NC-109 project.

Committee 3 recommends that data should be collected to fill the gaps revealed when the census of depth and duration data is completed. Data should be collected for those soils where a need is apparent and no known data exists, without waiting for the census of available data. A further recommendation is investigate the possibility of using easily collected data (such as particle size distributions and bulk density) to estimate soil moisture characteristics that are more difficult to determine such as saturated and unsaturated hydraulic conductivity.

Charge 3:
There seems to be general agreement that the soil survey program should actively pursue the collection of soil moisture data. It is pointed out that both SCS and university soil scientist are in the position to do this work. What is required is for it to be given high enough priority by both SCS and the universities. Additional funding is also needed. Standardization of methods and reporting format is also an item to consider.

The comments indicate that to some extent university personnel feel it would be relatively easy for them to expand their efforts, particularly where special studies are required. It is felt that SCS county soil scientists could carry out the more routine type of investigations. This would require more emphasis by the state soil scientists on programing soil moisture studies into the project soil survey during the planning stages. Soil scientists would then be able to take the necessary time to carry out these studies.

Committe 3 recommends that both the SCS and the state universities expand their efforts to collect needed additional soil moisture information. Special studies would appear to be an appropriate function of the universities while SCS could carry out routine studies.

It is recommended that soil moisture studies should be programmed into a project soil survey during the planning stage. State soil scientists can encourage field soil scientists to estimate and compile the soil water state information and fill in other parts of the Grossman Soil Survey Water Information Sheet. Field soil scientists should be informed as to why the various studies are being done and they should be given the results of a study for their use.

A further recommendation is that the Principle Soil Correlator should provide state soil scientists with current information on soil moisture investigation methods such as are outlined in Soil Survey Investigation Field Procedures and Soil Survey Note No. 7. Presumably, this information would then be disseminated further to working field soil scientists.

A final recommendation is that a future Soil Moisture Committee should evaluate the new classes for hydraulic conductivity given in §603.02-1(h)(4), page 603-19, National Soils Handbook.

Soil Survey Water Information Sheet:
A consensus seems to be that field testing of this format should be done by developing the information for some key soils and comparing the results against current interpretations. See the recommendations relative to Charge 3 for a further comment. Samples of a soil, adjusted to a 15-bar moisture content, were available for Committee 3 meeting attenders to sample and evaluate. Generally, surprise was expressed at how moist the samples felt at this tension. This indicates the need for calibration of our sense of touch before estimating soil water states.

Moisture Control Section: In response to the Chairman's query, the consensus is that the concept of the moisture control section should be tested, but this is an item with a relatively low priority.

NC-109 Project: There was little written response to the chairman's query concerning the close alignment between the NC-109 project and Committee 3. However, during discussion at the committee meeting this relationship was recognized. It was recommended that NC-109 proceed with a census of data relevant to depth and duration of saturated zones in response to Charge 1.

Committee 3 Members:
*Erling E. Gamble, Chairman
Dave Lewis, Vice Chairman
Jerry D. Larson
Lester J. Bushue
Dennis Heil
*Don

North-Central Regional Work Planning Conference

of the

National Cooperative Soil Survey

April 2-5, 1984

Final Report of Committee 4

Report of Committee 4

Members who submitted comments on the charges to the committee were:

Present	Letters only
Milo Harpstead - Chairman	Roger Haberman
Robert Pollock	Steve Messenger
Gerald Miller	Dave Lewis
Gerhard Lee	Doug Malo
Don Last	Steve Holzhey

Others contributing to the discussion session:

Randy Miles	Rod Harner
Richard Christman	Sy Ekart
Mark Kuzila	Fred Minzenmayer
Neil Smeck	Jake Jacobson
James Baker	Michael Thompson

Committee 4 met from 12:45 - 2:45 in room 225 of the Ramada Inn, Manhattan, Kansas on April 3, 1984.

Charge 1: The development of innovative ways for using the soil survey to improve agricultural practices and to assist the agricultural community in using soil surveys more extensively.

Findings:.

An updated list of publications and audio-visual, materials is needed and the chairman has been made aware of a few of them as follows:

From Ohio State University

Guide for Developing Soil Potential Ratings, Bul. 699

Land Use Planning for a Better Environment July 1983 from the Ohio Alliance for Environmental Education, Columbus.

From Wisconsin

A vidio recording "Soils and Soil Surveys of Wisconsin. Part I and Part II." It is available from Don Last who is a member of this committee.

From Minnesota

A Newsletter for Minnesota Cooperative Soil Survey has been developed to help keep potential soil survey users up-to-

Some states have mandated that soil survey information be used in assessing agricultural land. It was reported that Ken Olson, now at the University of Illinois, has compiled a list of states using soil surveys to aid in assessments. A copy of the report was received after the conference:

Olson, Kenneth R. and G. W. Olson, Utilization of soils information in the preferential tax assessment of agricultural land in the United States. Agronomy Mimeo # 81-39, Cornell University, Ithaca, New York 14853. 20pp.

The utilization of soil survey by state for assessment is by no means clearcut. It appears, however, that 23 states do use them in varying degrees and 27 report little or no utilization of soil surveys in this manner.

Recommendations

It is recommended that this charge be continued for the 1986 workshop to enable us to keep abreast of new developments in this phase of education. An updating of the list of materials cited above is a case in point. The charge, however, should not be directed just to agricultural applications.

The SCS, as an agency, should shift more resources from preparing soil survey to publicizing and explaining their use. Such activity could help to set the stage in demonstrating a need for soils specialists when the mapping of a state is completed.

Charge II If the determination has been made that an existing soil survey needs updating, what should its format be and how should it be distributed?

Findings

There should be flexibility depending upon amount of reworking of the old survey that is required.

Placing mapping unit descriptions in tabular form will facilitate computerization of the information.

The matter of scale received discussion and the majority recommendation was that scale should be flexible from county to county. However, there ware those who felt that advantages of a uniform 1:24,000 scale outweigh the disadvantages.

It was felt that for the foreseeable future there will remain a need for published interpretive sections of the report. However, itis essential to have the information computerized and readily accessable on microcomputers at several agency offices within the county.

It is recommended that this charge be discontinued.

Charae III Develop guidelines to aid in achieving accuracy and precision of data from various laboratories in analyzing soil samples for NCSS.

Findings

The National Soil Survey Laboratory has computerized records of soil samples. This data is becoming available and states are being asked to check the data.

There is no certification of cooperating labs and none was recommended.

Bulk samples of ten soils used in the atudy by Rust and Fenton in SSSAJ 47:566-569 1993 are available from the labs involved in tha study as listed in Table 2 of their article.

Continued use of standard samples is recommended but no specific method of checking for precision among the labs was recommended.

It was felt that some variation in methodology within the region should be accepted.

It is recommended that this charge be discontinued.

Summary

This committee recommends continuation of the Educational Activities Committee.

United States Department of Agriculture

Soil Conservation Service

P.O. Box 2890
Washington, D.C.
20013

February 9, 1984

NATIONAL BULLETIN NO. 430-4-12

SUBJECT: SOILS - PROMOTING THE USE OF SOIL SURVEY INFORMATION

Purpose. To distribute a list of innovations for promoting the use of soil survey information.

Expiration Date. This bulletin expires April 2, 1984.

Enclosed is a list of some innovations (received in response to National Bulletin No. 430-3-15) for promoting the use of soil survey information to help achieve soil and water conservation objectives., Most of these have been tried in one or more States and found to be especially successful. If you would like more details about any of the innovations , you may contact the States indicated. We listed the first one or two States that submitted the innovation.

Because of their ability and experience in conducting educational programs for the public, the Cooperative Extension Service can be especially helpful in planning and carrying out activities such as those in the enclosed list.

we request that States continue to notify us of any innovations that prove successful in the future and we will summarize and distribute them periodically.

Kenneth C. Hinkley

RICHARD W. ARNOLD
Director, Soil Survey Division

Enclosure

DIST: N, T, S

The Soil Conservation Service
is an agency of the
Department of Agriculture

WO-AS-1
10-79

15. Prepare a walk-through, labeled pit exposing the soil profile, at farm shows such as science reviews, equipment displays, demonstrations, and field days (KY).

Self-guided Soils Tour

16. Develop self-guided tours relating soils, landscapes, and land use (FL, NY).

17. Develop driving tour guide of soils along interstates and other major highways using highway mile-markers as reference points (TN).

18. Name soils along nature trails. Examples:

TN has named the soils and installed water table pipes to illustrate how ground water tables fluctuate, along some nature trails.

In FL soil pits are dug along a self-guided nature trail at the Plant Materials Center for use by local schools and as training sites for scs.

In OH, soils and their properties, natural setting, 'landscape features, etc. (but no pits allowed) can be observed along nature trails on 100-acre foundation tract.

A plate glass-covered soil profile is exposed and described along a nature trail in Mobile, AL.

The publication "Guide to Hawaii" is a self-guided soil tour. It describes and classifies the soils and provides laboratory data for seven sites en the Big Island and four sites on Oahu.

Displays of soil monoliths (and appropriate descriptive and interpretive material):

19. At rest stops along major highways.

20. Along nature trails (KS). As an example, the Wichita Zoo has a collection of soil monoliths, each in an enclosed case with a plexiglas front. Four of these are displayed along nature trails at one timer they are replaced with another set every 2 or 3 months. The displays face north because direct sunlight causes discoloration of the soil.

21. At fairs and other resource-oriented activities, schools, colleges, parks, arboretums, public offices, public buildings, and special conferences and workshops (LA, GA, TN, IN, MS, ME). As an example, soil monoliths are being prepared for the major soils in MS for Mississippi's new Museum of Agriculture. Tennessee has proposed a soils display for Visitors Center at the Great Smoky Mountain National Park in Gatlinburg, TN.

Other Soil Displays and Exhibits

22. Detailed exhibit in window at airport (where people commonly have time to look) (NH). The one in the Manchester Airport includes soil micro-monoliths, soil survey leaflets, and an aerial photograph with the location of the airport shown. Viewers are directed to the SCS field office for further information. The conservation district adopted this format for their display

at the county agricultural fair and for long-term "se in the SCS district office.

23. Page-size posters that have cartoons related to how the Jackson County soil survey can help a special group of users. Different colored paper is used for each special group, for example, blue for home buyers, yellow for developers and builders, and light green for fanners and rangers. On the back of each poster is a guide telling where to find information related to the special group of users, in-the published soil survey (MI).

24. Use of landscape-vegetation-soils relationship diagrams (slides, prints, and displays) (ME).

25. Illustrations showing soil depth, rooting depth, limiting soil layers which limit water movement and root penetration, presence of coarse fragments, etc.

26. Poster board displays that emphasize how to use soil surveys (placed in local banks, schools, public libraries, and other public buildings and places (TN).

27. Glass jars containing "reconstructed" soil profiles displayed at local professional, civic, and community meetings (TN).

28. Display board in the USDA Service Center for Gentry County (micromonoliths for each kind of soil in the county, block diagrams locating the soils in the landscape, and photographs of the different landscapes) (MO).

29. Displays at county and state fairs (AR, OH, MO).

30. Permanent soil ecology exhibit in Visitors' Center at the U.S. Army Corps of Engineers' Cowanesque Dam Recreation Area (PA).

31. Displays of soil micromonoliths at public meetings, schools, banks, SCS field offices, and other appropriate places (NJ, MO, IL).

32. Exhibits of sand paintings. Different colored sands are collected and used to create sand paintings (MO).

33. Wyoming County Conservation District's demonstration booth at the county fair exposes soil survey information to 10,000-12,000 people annually (NY).

34. Conservation exhibit for the general public (NJ).

    Use closed copy of local published soil survey with the cover page up. Use a section of the general soil map showing a" area known to the public, for example, a major park (scale 1:63360). Use a caption such as "Area generally suited to hiking, wildlife, etc. Area poorly suited to urban development."
    Atlas sheet for the same area (scale of 1:15840) with legend and selected interpretations.
    Part of area (scale of 1:200 or 1:2400) showing small random areas suited to high intensity uses in contrast to general map and statement.

35. Drawing giving specifications for preparing a stand for soil profile displays (ID).

Soil Survey Education Kit

36. Develop Soil Survey Education Kit (MO). The kit (developed by the MO Department of Natural Resources, SCS, and University of MO Extension Service) contains many tips and examples for getting soil survey information in print. Examples are 12 soil survey news topics, a variety of newspaper articles and letters, fact sheets about a survey area, and tips on distributing the published soil survey, creating a soil survey display, constructing soil survey posters, and producing an audio-visual program on the soil survey.

Fact Sheets

37. Develop and distribute simple, concise information sheets about the soil survey, and place the sheets in strategic locations in the community prior to releasing the published soil survey. Also, a copy can be placed in the published soil survey when handing or sending a copy to en user. These sheets have been an excellent technology transfer vehicle (WA).

Conservation Education Field Day

38. Use soil monoliths and explain important soil features (drainage, color, texture, etc.) end discuss the different kinds of soils in the county. Give each teacher a copy of the published soil survey of the area and ask that they keep it in the school library or science department as reference material. This exposes the survey to hundreds of school teachers in one day and hopefully to many students of the future (NY).

Township meetings

39. Conduct a meeting (after completion of field mapping) of farmers, bankers, fertilizer salesmen, and others to discuss what was done in making the soil maps and how the information could help each individual present. The completed field sheets are brought to the meeting and individuals are encouraged to study the map of their farm or area of interest. Daytime meetings in the winter and potluck dinners in the summer are featured. Emphasis is given to identifying and overcoming soil problems, getting the most out of the soil, and to conservation planning. (IL)

Land Atlas and Plat Book

40. Combine soil survey information with the land atlas. The Callaway County SWCD is getting soil survey information out to the public this way. The land atlas and plat book contains a table of contents, index to township maps, general information about what the SWCD is and does, the general soil map, and descriptions of the units on the map (MO).

Presenting the New Published Soil Survey

41. Conduct a VIP meeting to introduce the newly published survey. The SWCD arranges for the participation of the Congressman who "presents" the

survey to local leaders invited to a banquet meeting. State leaders, including the State Conservationist and the Director of the Experiment Station, discuss the importance of the soil survey and a soil scientist discusses, in general terms, how to "se it (OH, IN).

42. Provide copies to the college and university professors who teach in the environmental disciplines (VT).

43. Meet with real estate agents, engineering consultants, county park boards, planning commissions, county commissioners, county sanitarians, contractors, extension agents, state board of health, and others, highlighting sections of the publication that is being used by their discipline (IN, VT).

44. Inform all local offices of state and federal agencies, dealing with landowners, of the availability of the soil survey (VT).

45. Give training sessions for different groups of users (AR, GA).

46. Provide each town planning commission with a mosaic of the soil maps for their town (VT).

Joint Workshops

47. Hold SCS and Cooperative Extension Service joint workshops each year. At these workshops, offer to area people a copy of the published soil survey along with detailed analysis of their soils (their capabilities, drainage characteristics, need for erosion control, lime and pH requirements, expected yield changes due to improved management, etc.) (NY).

Steering Committee

48. Use steering committees during the field work of a soil survey as well as after publication (OH).

Assisting School Students

43. Present basic exercises to high school students as requested (locate house or farm, list the soils, and go through tables to find suitability and limitations for various uses) (IN).

50. Assist with tours for fifth grade through junior high students and introduce the students to soils, their differences, and their importance as a natural resource (IN).

Soil and Water Conservation District (SWCD) Newsletters

51. Assist in preparing attachments for the SWCD newsletters that explain some portion of the soil survey and its use. These newsletters reach hundreds of farmers and people in Aqri-businesses (IN).

Publications and Handout Material

52. Brochure: "Understanding Soil Maps" (CT, ME).

53. Teachers' education publication: "An Introduction to the Soils of Pennsylvania" (prepared by Pennsylvania State University with help from SCS) (PA).

54. A popularized edition of Hawaii's Soil Survey explains what a soil survey is and who can use the information and gives examples of interpretive maps (HA).

55. The State Department of Agriculture's brochure, "Agricultural Lands of Importance to State of Hawaii," is a" interpretation of the soil survey that provides decision-makers a tool for land "se planning (HA).

56. The pamphlet, "The Land and Agriculture of Nebraska," has been widely used at rest stops on Interstate 80, which crosses Nebraska from east to west (NE).

57. The Pulaski Conservation District's booklet, "A Guide to Soils in Pulaski County," generated a lot of requests for soil survey information (AR).

58. Georgia's Soil Classifiers Association is printing a brochure promoting soil surveys (GA).

59. Interpretive quide for users of soil surveys (CA, HA).

60. Brochures and handouts in conjunction with SWCD's (IN).

"Checklist for Homebuyers" - Posey County
"For Land's Sake

COMMITTEE 5 - SOIL CORRELATION AND CLASSIFICATION.
CONFERENCE REPORT
Manhattan, Kansas, April 3-5, 1984

Committee Members:

Richard H. Rust, Chairman	D. Rex Mapes
J. Wiley Scott, Vice Chairman	Richard E. Mayhugh
Edward L. Bruns	Delbert L. Mokma
Marvin L. Dixon	Neil E. Smeck
Edward L. Fleming	Neil W. Stroesenreuther
Ivan J. Jansen	Bruce W. Thompson
Ronald J. Kuehl	Robert L. Turner
Gilbert R. Landtiser	Larry D. Zavesky

Charges:

1. Review application of horizon nomenclature.
2. Develop guidelines for recorrelation of published surveys.

Other committee concerns:

1. Classification of disturbed soils.
2. Updating or revising series concepts.
3. Consideration of soft rock material in classification.

Summary and recommendations:

Charge 1: The new soil horizon designations have been in use for some time. Problems with use of the designations need to be identified and agreement reached on application.

This matter was discussed at our last regional conference in Fargo. It was also a matter of report at the April '83 National Conference (Committee 6). While the National Committee appears to have 'closed the book' by recommending its own termination, it would appear that some issues are still unresolved. A soil correlators workshop of this region also deliberated (Nov-Dee '83) on soil definitions.

Recommendations:

(a) This committee discussed the merits of using more quantitative language for many of the proposed subscripts, and the possibility of tying any defined quantities to the definition of diagnostic horizons. It is the recommendation of this committee to not try to make the horizon subscripts specific for diagnostic horizons such as argillic, calcic, etc. It is the concensus of the committee that more quantitative language be used in some definitions to identify amounts or degree of expression so the subscripts are used more uniformly.

(b) The use of the "k" subscript seems troublesome, primarily to the western part of the region. The problem arises in the concept of solum. If Ck's become Bk's then solum thicknesses are affected, mollic epipedons are 'found wanting', and some sola are thicker than allowed in the range of the series.

At the regional soil correlators workshop a change in the definition of "k" was introduced. A pedogenic change is implied in addition to the accumulation of alkaline earth carbonates. Therefore, if pedogenic change has occurred, this zone is a part of the solum. They also stated that a Bk horizon should not be massive.

It is the recommendation of this committee to retain subscript "k" but only in the B horizon and not in the C horizon or any transitional BC horizon. The committee agreed that Bk horizons should not be massive. The change from Ck to Bk horizons will likely require changes in allowable ranges of solum thickness in series definitions and, in some cases, changes in differentiating criteria.

(c) The use of the "n" subscript seems troublesome, primarily to the western part of the region. Part of the problem is in understanding the definition. The definition in Chapter 4 of the Soil Survey Manual states "This symbol is used to indicate accumulation of exchangeable sodium." The does not appear to imply such terms as "pedogenetic" or "secondary." The committee discussed whether sodium content must show an increase of more than that in the parent material to offer proof of its accumulation. The committee believes that the use of the subscript communicates some judgement of the soil scientist who described the pedon. This committee recommends that the subscript "n" be retained and that authors of chapter 4 strengthen the definition so it may be understood more uniformly. The committee also recommends that the wording include SAR in the definition as well as exchangeable sodium.

(d) A proposal has been made to restrict the use of subscript "r" to weathered or soft bedrock and introduce a new definition of a subscript "d" for dense materials other than bedrock. Committee 6 of the NCR Conference in Fargo and Conittee 6 of the National Work-Planning Conference recommend the use of the subordinate horizon designation "d". The suggested definition is stated as Charge 3, Recommendation 1 on page 96 of the Proceedings of the National Technical Work-Planning Conference of the Cooperative Soil Survey, Washington, D.C., March 28-April 1, 1983.

Some of us would like to modify that definition. A proposed definition was discussed at the Soil Correlators' Workshop, Lincoln, Nebraska, November 28 to December 2, 1983.

This committee recommends the following definition:

d--Dense unconsolidated materials.

This symbol is used with "C" to indicate naturally occurring or man-made unconsolidated materials sufficiently dense that roots cannot enter except along fracture planes. The high density has developed from stress loading or other non-genetic processes. Lodgement till (commonly called basal till) and compressed layers in reclaimed soils are examples.

Charge 2: Guidelines are needed for recorrelation of published soil surveys. Should recorrelation be done on an individual survey area or on a broader basis, such as an MLRA? Should the original soil name be retained, or should recorrelated names be used in the information that goes to the users? Committee 4 considered the <u>format</u> to present the updated material, and this committee addressed the <u>content</u> of the updated material.

This matter has been addressed, most recently, in National Bulletin No. 430-4-4 (November 83). Also by the National Issues Committee 3 for the April 83 National Conference. Several states have had experience in using the Evaluation Sheet (issued July 83). Whether the evaluation sheet is adequate to the problem may need further discussion. For example, changes in land use may need further documentation. This committee discussed whether an evaluation should be made on a regular basis, possibly every 5 years, or only after a formal request has been made by the users.

<u>Recommendations:</u>

This committee recommends that published soil surveys be evaluated by each state as necessary. The first evaluation shoud be after a period of 20 or 25 years after publication, or sooner when a need is identified, but not on a regular basis. The need may be identified through use by the cooperating agencies or through a request from an individual, a group, or a unit of government. The committee recommends that a schedule of re-survey or recorrelation, or even of the evaluation, should not be made a part of CASPUSS.

Other committee concerns

1. A matter of interest and concern to several states is the classification of disturbed soils. This committee discussed the issue and some of the concepts involved in classifying disturbed soils and the proper chioce of suborder. The choice appears to be between suborders Orthents and Arents. Part of the dilemma arises from incomplete, or sketchy, definition of, particularly, Arents. (This has likely encouraged the 'Spolent' terminology.)

Disturbed soils assume several conditions generally depending upon depth of disturbance and methods of handling the soil material.

This committee recognized that Committee 6 is dealing with this subject as one of their charges, and voted to make no recommendations on classification of disturbed soils at this time. Attached are comments from two committee members that state their views on the subject.

Robert I. Turner, soil correlator, MNTC writes:

> Our present emphasis on providing interpretations and making predictions for bodies of soil tends to emphasize the identification at the series level. Under our present set up that is the only way to get interpretations printed in the tables of the published soil survey.
>
> I have been satisfied, to this point in time. with classifying the soils as Orthents. Fragments of diagnostic horizons distributed throughout several feet of regolith seems pretty weak evidence on which to place a soil in Arents. Areas that will be reclaimed by replacing mostly Ei horizons and putting A horizons back on top possibly should be called Arents.

The definition of Arents needs to be expanded and classes developed if we are going to classify mine spoil in this way. Reading the definition of Arents in Soil Taxonomy and in a set of lectures by GDS in Belgium in 1965 leads me to think that mine spoil was a minor consideration of this suborder at that time. Evidently, the emphasis has changed and the description should be expanded.

Wiley Scott, soil correlator in Illinois writes:

I would like to address the matter of classifying and correlating disturbed soils. In Illinois we are classifying these soils in the suborder Orthents. We have defined and established 4 soil series in materials reclaimed after surface mining of coal. These are the Lenzburg, Rapatee, Schuline, and Swanwick series. We also are using the Morristown series developed by Ohio. These soils are in materials that were disturbed and, except for the darkened surface layer or the upper 8 inches of soil, were mixed to a depth of several feet. In some cases the materials from the soil surface to the coal seam are mixed together. Naturally, the control sections of the soils defined in these materials contain random fragments of former diagnostic horizons such as mollic epipedon, argillic horizon of the pre-mined modern soil or from a buried paleosol. We don't believe that these random fragments meet the definitions for Arents. We believe that soils that will be reclaimed under the federal rules for prime farmland may meet the requirements of Arents. They will likely have the A, 8, and C horizons removed in sequence before mining and replaced in sequence after mining. We would very much like to see the definition for Arents expanded to give additional guidelines for identification and classification of soils. The entire definition of the suborder is less than a half page in Soil Taxonomy. We have heard the term Spolents bantered around, but have not seen a definition of it. If someone were to write a definition, and circulate it for comments, or propose it as an amendment to Soil Taxonomy we would evaluate it and comment on it.

2. Updating or revising series concepts. It is a matter of concern to some that this process is too often a "last minute" exercise in obtaining neighboring state(s) acceptance of revisions. This committee recognizes the need to identify changes early in the survey and plan ahead for requesting or making the changes, but has no formal recommendation.

3. Consideration of soft rock material in classification. These materials, such as shale, often exhibit some water-holding capacity, some porosity, and perhaps other "soil-like" qualities. Should the definition of soft rock be quantified by reference to some hardness scale or penetrability scale or other measurable properties?

Richard E. Mayhugh (formerly soil correlator in Kansas) wrote:

In Kansas many shale fragments will not fit within the definition as given in the new manual. Although they are somewhat porous, water holding capacity is somewhat low. Roots do not penetrate; therefore, water available to plants is nil. When placed in water they collapse in a matter of. seconds. Apparently in the field they are never saturated. Where the volume of these fragments are great enough, the soil reacts as skelatal in its effect on plants. We prefer to classify them as skeletal. Engineers will treat these fragments as soil material because they are easily crushed and can be compacted like soil material of similar texture. One alternative is to call these soft rock fragments and treat them differently on the Soils 5's. This would necessitate a change in the definition of rock fragments to any fragment of geologic material that roots cannot penetrate.

Should consideration be given to modifying interpretations for agronomic applications vs. engineering applications based upon some measurable properties? This committee only briefly discussed this item at the conference and made no recommendations.

4. Continuation of committee.

It is recommended that this committee of soil correlation and classification be continued to discuss items of current interest. The present committee made no specific recommendations for charges.

The conference accepted the report of Committee 5.

J. Wiley Scott
J. WILEY SCOTT
Vice-Chairman

JWS:ssl:soils2/31

NORTH CENTRAL REGIONAL
TECHNICAL WORK-PLANNING CONFERENCE
OF THE
NATIONAL COOPERATIVE SOIL SURVEY
MANHATTAN, KANSAS
APRIL 2-5, 1984

COMMITTEE 6

CLASSIFICATION, INTERPRETATIONS, AND MODIFICATION OF SOILS ON MINE SPOILS AND DISTURBED SOILS

Charge 1. Determine the properties and their variability which are important to the reclamation activities in the region. Properties are to be cited specifically by state and to include oil and salt polluted soils.

Charge 2. Methods to achieve uniform implementation of rules and regulations for restoring mined land.

The committee, except for Jerry Post and Maurice Mausbach, were asked to respond to each of the charges. Jerry Post was asked to solicit comments from other states, outside of the region, as to the development for the reconstruction of prime farmland. Maurice Mausbach was asked to prepare a summary of the research on mine spoil and disturbed areas in the north central region. A copy of the summary is attached. Each of the committee members responded. A summary of their responses are as follows:

Illinois: The "Specifications for Prime Farmland Soil Reconstruction on Surface Coal Mined Lands in Illinois" has been prepared and is being reviewed at the present time. A copy is attached. These specifications divide the topsoil of all soils into two groups and the subsoil, including the substratum, into three groups. Each group is specifically defined. Each premined soil series has been assigned a topsoil and a subsoil group. Specifications of how the material in each group is to be replaced is discussed with options described. Soil handling methods are also discussed. One of the main points made is that where conditions can be improved, at no extra cost, the operator is encouraged to do so.

The University of Illinois is continuing an active research program relating to the restoration of mined land. There have been several soil series established in Illinois which were formed in material created by surface mining.

S. Oakota: The prime farmland being mined in South Dakota is of a very minor extent. Specifications regarding the reclamation of prime farmland have not been developed.

South Dakota State Law does require a reclamation plan however. The operator has a rather wide range in options as to how the land is reclaimed. There is an increasing problem of saline in the state; however, it is not a major concern at the present time. The

Forest Service and Land Grant Universities in the western part of the state are engaged in mine reclamation research.

Iowa: The reclamation specification for land reconstruction has been developed for the Technical Guide. These specifications require surface soil replacement for all soils. On Prime Farmlands the subsoil or its equivalent may be required to be replaced to achieve the productivity of the premined soil.

Indiana: A preliminary draft of "Specifications for Prime Farmland Soil Reconstruction' has been prepared for review only. A copy is attached. The specifications specify the soil depth and require the replacement of the A and B horizons, or the equivalent, in a manner which will avoid compaction that will create a soil of equal or greater productivity.

Missouri: The draft of "Specifications for Reconstruction of Prime Farmland" divides all soils into three topsoil groups and three subsoil or substratum groups. Each group is described as to its suitability for reconstruction material and if appropriate an alternate material is suggested. Topsoil and subsoil or substratum groups are listed for each soil series which is prime farmland. These specifications are very similar to those prepared for Illinois. Missouri is proposing a soil series similar to the Brazilton series in Kansas except it will he in the mesic family.

Kansas: Research relating to the contamination by heavy metals in connection with the lead and zinc mining in southeast Kansas is beinq conducted. A great deal has already been done. The draft of the "Specifications for Reconstruction of Prime Farmland" is essentially the same as Missouri's.

Ohio: Interim "Standards and Specifications for Reclamation of Surface Mined Prime Farmland" have been prepared. The specifications for soil removal, stockpiling, reconstruction, revegetation, and re-. storing soil productivity are very detailed. A copy is attached. The Ohio specifications are the most specific of any of those submitted to the committee.

N. Dakota: "Mined Land Reclamation Prime Farmlands Soil Reconstruction Specifications" are in the draft stage. There are six specifications. The first three deal with identifying and locating the prime farmlands. Nunber one deals with stockpiling the topsoil, two the reshaping of the landscape, and three the thickness of the lifts, by series, of the topsoil and the subsoil or substratum. These specifications are brief but explicit. A copy is attached.

Other: From outside the region the Committee heard from Alabama, Arizona, Colorado, Kentucky, Maryland, Montana, New Mexico, Tennessee, West Virginia, and Wyoming. Alabama has not developed specifications other than those indicated in the Surface Mining Act for soil handling. In Arizona soils must be irrigated to be rated as prime. To date the coal mining in Arizona is not in the irrigated areas.

Colorado has not prepared any guidelines and the SCS is not aware of any research
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Of the other items suggested for discussion by this committee, I would like to address the matter of classifying and correlating disturbed soils. In Illinois we are classifying these soils in the suborder Drthents. We have defined and established four soil series in materials reclaimed after surface mining of coal. These are the Lenzburg, Rapatee, Schuline. and Swanwick series. We also are using the Morristown series developed by Ohio. These soils are in materials that were disturbed and, except for the darkened surface layer or the upper 8 inches of soil, were mixed to a depth of several feet. In some cases the materials from the soil surface to the coal seam are mixed together. Naturally the control sections of the soils defined in these materials contain random fragments of former diagnostic horizons such as mollic epipedon, argillic horizon of the pre-mined modern soil or from a buried paleosol. We don't believe that these random fragments meet the definitions for Arents We believe that soils that will be reclaimed under the federal rules for prime farmland may meet the requirements of Arents. They will likely have the A, B, and C horizons removed in sequence before mining and replaced in sequence after mining. We would very much like to see the definition for Arents expanded to give additional guidelines for identification and classification of soils. The entire definition of the suborder is less than a half page in Soil Taxonomy. We have heard the term Spolents bantered around, but have not seen a definition of it. If someone were to write a definition, and circulate it for comments, or propose it as an amendment to Soil Taxonomy we would evaluate it and comment on it.

SUMMARY: Charge 1 - The specifications developed by the various states have for the most part identified the properties and their variability which are important to the reclamation activities in the reqion. The committee in session felt that as the specificationsare currently being developed our contribution is somewhat limited. The committee did feel, however, that specific techniques should not be a part of the specifications. Making the techniques used a part of the specifications could restrict the development of new techniques. They could be a part of the technical guide however.

Charge 2 - In the eastern part of the region, the specifications are being developed at the present time. They are being prepared in conjunctin with the adjoining states. The committee in session felt that the specifications in adjoining states, which have mining occurring in similar soil should have similar specifications. The recommended techniques should also be similar.

Jerry Bigham was unable to attend the conference, however, he sent along the following comments:

First, I would have no major objections if the planning committee should elect to abolish our group. I believe we have a major need for improved soil interpretations on mined lands, but this activity could probably be absorbed by Committee Two. If Committee Six does continue to function, I hope we can address some of the specific problems faced by the SCS and our regulatory agencies in developing standards and specifications for reclaiming mined prime farmlands. A few examples might be:

1. How should the SCS interact with regulatory authorities and what is the specific role of the local soil scientist and/or conservationist in establishing reclamation standards?

2. Can we establish minimum standards or limits for certain soil properties when developing reconstruction plans? For example, is it reasonable to specify maximum compaction levels and minimum coarse fragment contents for replaced soil materials? What is the best procedure for measuring compaction?

3. Can we develop moisture content limits for soil handling as related to texture, soil removal and reconstruction methods, and yield-limiting compaction levels?

4. Can we develop methods for predicting crop productivity based on selected mine-soil properties? If not:

   a) How does one best select a reference crop for determining agronomic productivity? In some areas, this may be evident; however, in southeastern Ohio crop rotations are utilized and the crop grown on prime farmland units may not be the major crop in the area.

   b) How does one establish a success standard for a given reference crop? For example, should target yields be based on county averages, adjusted productivity indices in county soil survey reports or extension bulletins, actual field trials, etc.?

   c) How does one establish management levels for evaluating mine-soil productivity?

Perhaps these and related questions are not in the realm of our responsibility, but I think they represent practical problems we will be facing in the future. Good luck at the upcoming conference!

The committee recommends that the committee be continued. They do recommend that the name be changed to "Research and Modification of Soils Formed in Mine Spoil and Disturbed Areas." The Committee recommends that, as the soil formed in mine spoil and disturbed areas .are classified at the series level and mapped at the phase level, the classification and interpretation of these soils be handled by the respective committees.

The committee recommends that the following be considered as charges for future committees:

1. States report on techniques of implementation of specifications and regulations.

2. A report on the research being conducted on mine spoil and disturbed areas.

3. Evaluate methods of assessing the physical properties of reconstructed soils.

There was a brief discussion about the use of Arent versus Orthent in classifying soils formed in mine spoil and disturbed areas There seems to be an inconsistency between regions which needs to be resolved. The committee did not recommend any particular action. When the committee report was made to the conference a suggestion was made from the floor that future committees also consider the reclamation of mine spoil from metallic mines.

Six members of the committee were present at the conference. Approximately twenty-two other participants of the conference attended the committee meeting.

Wells F. Andrews

WELLS F. ANDREWS
Chairman

Attachments

WFA:ssl:soils2/32

SECOND DRAFT
December 1983

SPECIFICATIONS FOR PRIME FARMLAND SOIL RECONSTRUCTION ON SURFACE COAL MINED LANDS IN ILLINOIS

Soil Conservation Service
301 North Randolph Street
Champaign, Illinois 61820

Topsoil Group B - Other surfaces -- Normally light colored,

There is 2 greater likelihood for justification of substitute materials for topsoil in this group. However, for many of the soils there are no available materials better than the existing A horizon. Substitute material will be considered only if the final soil will have a greater productive capacity than that which existed prior to mining. The E horizon (formerly A2) must also be replaced as part of the topsoil unless suitable substitute material is approved. There is a greater likelihood for acceptable substitute material for the E horizon than for the A horizon.

SUBSOIL SPECIFICATIONS - As used herein, the term subsoil refers to the root medium below the reconstructed topsoil 2nd above 48 Inches.

Subsoil Group A - Thick favorable B and C horizons.

Options: 1. Replace B horizon

2. B and C nixed with final mix containing no more than 50 percent C horizon and less than 5 percent calcium carbonate equivalent.

3. Where opentlons are expected to produce more favonble physical conditions, nixes with a higher proportion of C horizon or other strata and greater than 5 percent calcium carbonate equivalent might be permitted.

Subsoil Group B - Favorable B horizons but unfavorable C horizons.

Options: 1. Replace B horizon.

2. B and C mixed with final nix containing no more than 25 percent C horizon.

3. Fourty-eight inches of B and C mix if the pH does not exceed 8.4.

Subsoil Group C - B horizon less favorable than B and C horizon mixture.

Options: 1. B and C mixed with no more than 50 percent B is desirable.

2. Replacement of B horizon alone is permitted by the Act but is not preferred.

REGRADING - The acreage of reconstructed soil meeting prime farmland criteria shall be equal to or greater than that identified prior to mining.

Soil Handling: Grading methods will create a favorable physical condition.

A. Subsoil - Root medium placement.

1. Scraper - It is known that this method of placement results in greater compaction than other methods. Where this is the principal method used, some means for breaking up compacted layers needs to be indicated in the plans.

2. Trucks - Approve (traffic on base level preferred).

3. Wheel - Approve.

4. Dragline - Approve.

B. Topsoil placement.

1. Scraper - Approve. Take actions needed to minimize compaction. Do not grade when wet.
2. Trucks - Approve.
3. Wheel - Approve.

STABILIZATION - Provisions for erosion control meet requirements of the Soil Conservation Service field office technical guide. Provisions for adequate surface drainage to assure that the reconstructed soil will meet all criteria for prime farmland must be included.

SCS should point out where the opportunity exists, at no extra cost to the operator, to create a reconstructed soil that is better drained or less erosive than that which existed prior to mining.

DRAFT

PLACEMENT OF SOIL SERIES IN TOPSOIL GROUPS AND

SUBSOIL GROUPS TO GUIDE PRIME FARMLAND SOIL RECONSTRUCTION

Soil No.	Soil Series	Topsoil Group	Subsoil Group
308	Alford	B	A
131	Alvin	B	B
78	Arenzville	A	A
259	Assumption	A	B
61	Atterberry	A	A
14	Ava	B	C
787	Banlic	B	C
70	Beaucoup	A	A
382	Belknap	B	A
334	Birds	B	A,
13	Bluford	B	C
108	Bonnie	B	A
427	Burnside	B	B
134	Camden	B	B
171	Catlin	A	B
287	Chauncey	A	C
2	Cisne	B	C
2 5 7	Clarksdale	A	A
18	Clinton	B	A
428	Coffeen	A	A
122	Colp	B	C
621	Coulterville	B	B
112	Cowden	B	C
56	Dana	A	B
71	Darwin	B	C

Soil No.	Soil Series	Topsoil Group	Subsoil Group
45	Denny	A	C
87	Dickinson	A	B
24	Dodge	3	B
239	Dorchester	h	A
386	Downs	h	A
152	Drummer	A	B
75	Drury	B	A
180	Dupo	3	B
249	Edinburg	A	C
198	Elburn	A	3
119	Elco	B	3
567	Elkhart	A	A
280	Fayette	B	A
496	Fincastle	3	B
154	Flanagan	A	3
301	Grantsburg	3	C
344	Harvard	A	B
331	Haymond	3	A
214	Hosmer	3	C
3	Hoyleton	B	C
77	Huntsville	A	A
43	Ipava	A	A
454	Iv?.	B	A
28	Jules	3	A
242	Kendall	3	B
17	Keomah	3	C
175	Lamont	A'	3
451	Lawson	A	A

Soil No.	Soil Series	Topsoil Group	Subsoil Group
81	Littleton	A	A
517	Marine	B	C
176	Marissa	B	B
570	Martinsville	B	B
173	McGary	B	C
682	Medway	A	A
27	Miami	B	B
453	Muren	B	A
41	Muscatine	A	A
113	Oconee	B	C
150	Onarga	A	B
415	Orion	A	A
142	Patton	A	A
330	Peotone	A	B
199	Plano	A	B
148	Proctor	A	B
109	Racoon	B	B
74	Radford	A	A
481	Raub	A	B
723	Reesville	B	B
4	Richview	B	B
184	Roby	A	B
279	Rozetta	B	A
68	Sable	A	A
107	Sawmill	A	A
145	Saybrook	A	B

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SPECIFICATIONS FOR PRIME FARMLAND SOIL RECONSTRUCTION

The following specifications have been developed by the Soil Conservation Service in Indiana for carrying out prime farmland restoration responsibilities assigned in the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

The specifications are applicable to all prime farmlands historically used as cropland unless such lands are excluded by the grandfather clause or they are (1) used for long-term support facilities and roads, (2) approved for water bodies, or (3) smaller in area than three acres. These specifications supplement requirements in section 823.12 and 823.14 of rules and regulations published in the Federal Register Thursday May 12, 1983 (Vol. 48, No. 93).

SOIL REPLACEMENT SURFACE COAL MINING AND RECLAMATION OPERATIONS ON PRIME FARMLAND SHALL BE CONDUCTED ACCORDING TO THE FOLLOWING:

(a) The minimum depth of the soil and soil material to be reconstructed for prime farmland shall be sufficient to create in the regraded final soil, a root zone to sufficient depth to support the approved postmining land use. The minimum depth of soil and substitute soil material to be reconstructed shall be 48 inches, or a lesser depth equal to the depth to a subsurface horizon in the natural soil that inhibits or prevents root penetration, or a greater depth if determinied necessary to restore the original soil productive capacity. Soil horizons shall be considered as inhibiting or preventing root penetration if tbeir physical or chemical properties or water supplying capacities cause them to restrict or prevent penetrationby roots of plants common to the vicinity of the permit area and if these properties or capacities have little or no beneficial effects on soil productive capacity. Soil horizons considered as inhibiting for root penetration must be judged to contribute little or nothing to the productive capacity of the soil. Host fragipan horizons should not be considered as root inhibiting, and thus the depth of reconstructed soil would not be reduced to less than 48 inches. Restoration of soil productivity shall be considered achieved when the average yield during the measurement period equals or exceeds the average yield of the reference crop established for the same period for nonmined soils of the same or similar texture or slope phase of the soil series in the surrounding area under equivalent managemant practices. The reference crop on which restoration of soil productivity is proven shall be selected from the crops most commonly produced on the surrounding prime farmland. Where row crops are dominant crops grown on prime farmland in the area, the row crop requiring the greatest rooting depth shall be chosen as one of the reference crops.

(b) Replace soil material only on land which has been first returned to final grade and scarified, unless site specific evidence is provided showing that scarification is not necessary in order to meet the soil reconstruction requirements in (d) and (e) of this section. Provisions for erosion control meet requirements of the Soil Conservation Service field office technical guide. Provisions for adequate surface drainage to assure that the reconstructed soil will meet all criteria for prime farmland must be included.

SCS should point out where the opportunity exists, at no extra cost to the operator, to create a reconstructed-soil that is better drained (if somewhat poorly drained or poorly drained) or less erosive than that which existed prior to mining.

(c) Replace the soil horizons or other suitable soil material in a manner that avoids excessive compaction.

(d) Replace the B horizon or combination of loess and B horizon specified in section 823 and of the thickness needed to meet the requiremnts of paragraph (a) of this Section. The B horizon of the soil, a combination of B horizon and loess, or other suitable soil material reviewed and recommented by the Soil Conservation Service (USDA) will be replaced in such a manner that it will create a reconstructed soil of equal or greater productive capability than that which existed before mining

(e) Replace the A horizon as the final surface soil layer. This surface soil layer shall be adequate to meet revegetation standards and be repalced in a manner that protects the surface layer from wind and water erosion before it is seeded or planted.

(f) The estimated levels of yield shown are for existing prime farmland soils within the permit area. High level of management includes the following:

(i) Using cropping systems that help maintain good tilth and a high organic matter content.

(ii) Controlling erosion to the maximum extent feasible so that the quality of the reclaimed soil is maintained or improved rather than reduced.

PRELIMINARY DRAFT ·
FOR REVIEW ONLY

(vii)

SOIL CONSERVATION SERVICE
STATE OF OHIO
INTERIM STANDARD AND SPECIFICATIONS
FOR
RECLAMATION OF SURFACE MINED PRIME FARMLAND

DEFINITION

Restoration of surface mined prime farmland.

PURPOSE

Restore soil productivity, reduce erosion and sediment production, ard protect water resources. To comply with all state and federal laws and rules and regulations pertaining to mining of prime farmland.

CONDITIONS WHERE STANDARD AND SPECIFICATIONS APPLY

Areas of prime farmland disturbed or affected by surface mining. This includes those areas used for haul roads, soil stockpiling, sedlment pords, and other mining related uses.

SOIL REMOVAL

A. <u>Planning considerations</u>

1. Use a soil survey to identify the soil name and slope, erosion, and textural phases of prime farmland.

2. Consider the overall surface relief of prime farmland to be removed.

3. Consider surface and internal drainage conditions, flooding frequency, and surface or subsurface drainage systems used.

4. Consider the soil description of the representative soil profile for the county where the named prime farmland soil is to be removed. Refer to the published soil survey or soil description provided by a soil sclentlst.

5. Note soil properties such as color, texture, and content of coarse fragments; overall soil thickness and the thickness of topsoil and B horizons and C horizons, if present, from the prime farmland soil description.

6. Consider soil moisture conditions as affected by seasonal precipitation.

B. <u>Specifications</u>

I. Use a modern soil survey that meets the standards of the National Cooperative Soil Survey to identify and locate areas of prlme farmland.

2. Soil removal shall be completed by:

   a) Remove the topsoil layer (A, Ap, AE, AB, E horizons) and transport to designated area. If the natural topsoil layer is less than six inches thick, remove the top six inches and treat as topsoil.

   b) Remove the B and/or C horizons (BA, BE, B, BC, C horizons) to a depth of 48 inches or to Cr or R horizons and transport to separate, deslgnated area. C horizon material, when present above 48 inches, may be removed and mlxed with the B horizon.

3. Soil removal shall occur within soil molsture and temperature ranges that will minimize compaction.

C. <u>Stockpiling is not required where the method of mlnlrq allows the soil removal and reconstruction operations to be carried out concurrently</u>.

SOIL STOCKPILING

A. Planning considerations

1. Using a soil survey, evaluate soils being considered as sites for stockpiling. Consider the surface relief, percent slope, surface drainage and internal drainage conditions, susceptibility to slippage, flooding, and the presence of springs or seeps on hillsides.

2. Consider the time of year, duration of stockpiling, end general wetness conditions of the area to be used for stockpiling.

3. Consider erosion control measures to control off-site movement of soil materials.

4. Recognize the importance of positive drainage on stockpile surfaces.

5. Consider the effects of stockpiling on prime farmland soils used as stockpile sites.

B. Specifications

1. Consult the soil map and interpretations for the proposed stockpiling site to determine soils that may be subject to flooding or slippage. Sites subject to flooding or slippage will be avoided as sites for stockpiling.

2. Prepare the stockpiling area by removing all woody vegetation and other materials that may interfere with placement or removal of stockpiled soil.

3. Stockpile topsoil material.

4. Stockpile B and C horizons in a separate location from topsoil material.

5. If stockpiled soil material will not be used for reconstruction within 30 calendar days, stockpiles will be seeded and mulched to control erosion. Use revegetatlon specifications.

6. Construct berms, diversions, or other structures when necessary to prevent soil from eroding from the stockpile area.

7. Soil stockpiling shall occur within soil moisture and temperature ranges that will minimize compaction.

SOIL RECONSTRUCTION

A. Planning considerations

1. Use a soil survey to determine the chemical and physical properties of the soil before mining.

2. Consideration will be given to the use of earth moving equipment and techniques that minimize soil compaction.

3. Consider the. use of chiseling or equivalent treatment in the upper part of the B horizon before topsoil replacement to reduce compac- tlon and increase porosity.

B. Specifications

1. Reconstruction shall occur within soil moisture and temperature ranges that will minimize compaction.

2. Smoothing and final grading of the mine spoil will approximate the original soil contour and slope.

3. B and C horizon material shall be returned to the mined area and placed on graded spoils at a thickness not less than that of the unmined B and C horizons above 48 inches.

4. Topsoil material shall be 'returned to the mined area and placed on the B and C horizons at a thickness not less than that of the unmined topsoil or to a minimum of six inches if the unmined surface layer is less than six inches thick.

5. Final grading of the reconstructed soil shall provlde uniform slopes and positive surface drainage.

6. he reconstructed soil shall have an average slope within the slope raqe of the unmined prime farmland map unit.

7. Porosity of the topsoil and B and C horizons after reconstruction shall permit penetration of roots.

8. Reconstruction shall be completed to a minimum depth of 48 inches or to the depth of the unmined soil if the Cr or R horlzons occur above 48 inches.

9. Seeding and mulching of reconstructed soils shall be completed as soon as weather conditions permit after replacement of topsoil. Use revegetation specifications.

10. Avoid excessive trafflciq of earthnovlq and grading equipment which reduces porosity, and makes root penetration more difficult.

SOIL RMCETATIDN

A. Planning considerations

1. Soil tests are to be considered to determine nutrient levels of the reconstructed soil.

2. Drainage, slope, aspect, and other physical properties of the reconstructed soil will be considered in selecting an adapted seeding mixture.

3. A seeding mixture will be selected to control soil erosion..

B. Specifications

1. Use accepted methods for seedbed preparation and seeding. The last tillage operation shall be performed on the approximate contour.

2. Lime and fertilizer will be applied according to soil test recommendations for the targeted yield.

3. Seeding - The current Ohio Agronomy Guide will be used to select legume and grass seeding mixtures and seeding rates. All legune seed shall be innoculated with the proper type of innoculant to insure the presence of adequate nunbers of the desired bacteria for nitrogen fixation at the tlme of seeding.

4. Mulching - Cereal grain straw or hay will be applied uniformly at a rate of two tons per acre. All mulch will be anchored by crimping, asphalt emulsion, or comparable treatment. In areas of concentrated water flow, mulch netting or equivalent material will be used to provide additional stability.

5. Management - Areas will be promptly reseeded to control erosion and establish an adequate stand (75 percent of ground cover). Any harvestlng will be delayed until new seedings have made a minimum growth of ten inches.

RESTORING SOIL PRODUCTIVITY

A. Planning considerations

1. Soil tests are to be considered in determining nutrient levels of the reconstructed soil.

2. The landowners' objectives should be defined in the mining lease and considered during the development of management systems for restoration of productivity.

3. The reference crop will be selected from Attachment 1, list of reference crops, by county.

B. Specifications

1. Conservation practices such as contour farming, conservation tillage, crop rotation, and terracing will be applied to protect the resource base and control sheet and rill erosion at or below three tons per acre per year.

2. Water management practices such as grassed waterways, diversions, and grade stabilization structures will be Installed and maintained to control gully erosion.

3. Lime and fertilizer will be applied as recommended by soil tests as an integral part of meeting targeted yields of reference crops.

4. Soil tilth will be improved by including grasses and deep rooted legumes in the rotation.

5. All crop residue from row crops should remain on the field after harvest to help control erosion and increase soil organic matter content. Supplementing these residues with manure, sewage sludge, or other suitable organic materials is also recommended.

6. Drainage limitations of reconstructed soils can be corrected as needed by installing surface and/or subsurface drainage systems.

7. Tillage or ripping will be performed as needed to fracture any root limiting layers.

8. Currently accepted techniques will be used to control pests and plant diseases.

9. The current Ohio Cooperative Extension Bulletin 685 will be used to determine target yields for reference crops.

Technical References

1. Agricultural Handbook (AH 537), Predicting Rainfall Erosion Losses

2. Ohio Cooperative Extension Bulletin 472, Agronomy Guide

3. Section IV of SCS Technical Guide

4. Ohio Cooperative Extension Bulletin 598 Rev., Land Application of Sewage Sludge, 6/79

5. USDA-FS Technical Report NE-68, A Guide for Revegetating Coal Minesoils in the Eastern United States, 1981

6. U.S. Department of Agriculture, Agricultural Handbook No. 436, Soil Taxonomy

7. U.S. Department of Agriculture, Agricultural Handbook No. 18, Soil Survey Manual, and subsequent revised chapters 3, 4, 5, 6, 7, and 9

8. U.S. Department of Agriculture, National Soil Taxonomy Handbook, Amendments to Soil Taxonany

9. U.S. Department of Agriculture, National Soils Handbook

10. Ohio Crop Reporting Service, Ohio Agricultural Statistics, June 1983, SCS, Columbus, Ohio 11/83

11. Prime Farmland Map Units of Ohio, SCS, 10/82

12. Ohio Cooperative Extension Bulletin 685 Rev., Ohio Soils With Yield Data and Productivity Index, 7/83

13. Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 et. seq., Section 701 (20); Definition of Prime Farmland

ATTACHMENT 1

Recommended Reference Crop to Evaluate the Restoration of Productivity on Prime Farmland Use in Surface Mining for Coal

REFERENCE CROP - BY COUNTY1/

County	Reference Crop
Athens	Grass-Legune Hay
Belmont	Grass-Legune Hay
Carroll	Grass-Legune Hay
Columbiana	Corn for Grain
Coshocton	Grass-Legume Hay
Gallia	Grass-Legune Hay
Guernsey	Grass-Legune Hay
Harrison	Grass-Legune Hay
Hocking	Grass-Legune Hay
Holmes	Grass-Legune Hay
Jackson	Grass-Legume Hay
Lawrence	Grass-Legume Hay
Mahoning	Corn for Grain
Meigs	Grass-Legune Hay
Monroe	Grass-Legune Hay
Morgan	Grass-Legume Hay
Muskingum	Grass-Legune Hay
Noble	Grass-Legume Hay
Perry	Grass-Legune Hay
Stark	Corn for Grain
Tuscarawas	Grass-Legume Hay
Vinton	Grass-Legume Hay
Washington	Grass-Legume Hay

1/ Data reference - Ohio Agricultural Statistics 1982; Dhlo Crop Reporting Service; Columbus, Ohio; June 1983; pp. 56; Homer L. Carter, Agricultural Statistician in Charge; acreage harvested

District conservationists, U.S. Soil Conservation Service

NORTH DAKOTA

MINED LAND RECLAMATION PRIME FARMLANDS

SOIL RECONSTRUCTION SPECIFICATIONS:

As specified in the Federal Register / Vol. 48, No. 93 / Thursday, May 12, 1983. Rules and Regulations and in National Instruction No. 300-300 and 300-301.

The specifications are applicable to the following soils:

Arnegard, 0 to 6 percent slopes.
Bowbells, 0 to 6 percent slopes.
Falkirk, 0 to 6 percent slopes.
Grail. 0 to 6 percent slopes.
Grassna, 0 to 6 percent slopes.
Markhus, 0 to 6 percent slopes.
Mandan, 0 to 6 percent slopes.
Straw, 0 to 6 percent slopes.
Wilton, 0 to 6 percent slopes.
Other soils designated as prime farmlands.

The specific map units, for each county, designated as prime farmlands are listed in the North Dakota Important Farmlands. This publication is available at all Soil Conservation Service office in North Dakota.

The prime farmland mapping units in the -coal region of Western North Dakota are on concave slopes in swales, footslopes, fans, low terraces and floodplains. Slopes are 0 to 6 percent and mollic eippedons are 16 inches or more in thickness. The landscape of the prime farmlands is one that collects and stores run-off from surrounding soil areas. The prime farmlands are characterized by a potential native plant community that is more productive than surrounding soils and commonly supports species, such as big bluestem. uncommon on surrounding soils. The prime farmlands are characterized by . spring wheat productivity' index of 90 to 100.

The typical landscape positions of the Arnegard, Bowbells, Grassna. Mandan. [illegible]on to surrounding soils are shown in the following

ations are rewired for reconstruction of prime farm- or better productivity following mining to that of adjacent or nearby mined prime.farmlands.

1. Seperate stockpiling of topsoil(first lift materials) for prime farmlands.

2. Reshape prime farmland landscape. before replacement of 1st and 2nd lift materials, to include concave slopes that approximate the aerial extent existing before mining.

3. The range of lifts depts expected for prime farmland soils: (in inches)

Soil	First lift	Second lift
Arnegard	20-30	30-40
Bowbells	20-30	30-40
Falkirk	16-30	30-u
Grail	20-30	30-40
Grassna	25-40	20-35

Mandan	16-30	30-44
Straw	16-30	30-44
Wilton	16-30	30-44

The minimum depth of soil (1st lift plus 2nd lift) to be reconstructed is 48 inches.

4. The acreage of prime farmlands will be determined from the operation soil surveys used for planning by the Soil Conservation Service.

5. The location Of the prime farmlands ma, be adjusted based on the map of suitable plant growth materials prepared by the Professional Soil Classifer. (The acreage of prime farmlands to be reconstructed must be an acreage equal to that determined in item 4 above.

6. If small tracts of prime farmland are • cettered throughout the area to be minded. the small areas may be combined in the reconsturction following mining.

References:

Myers, Peter c.. Soil Conservation Service, National Instruction Nd. 300-300, Second edition. 25 July 1983,

Myers. Peter C., Soil Conservation Service,. National Instruction No. 300-301, 25 July 1983.

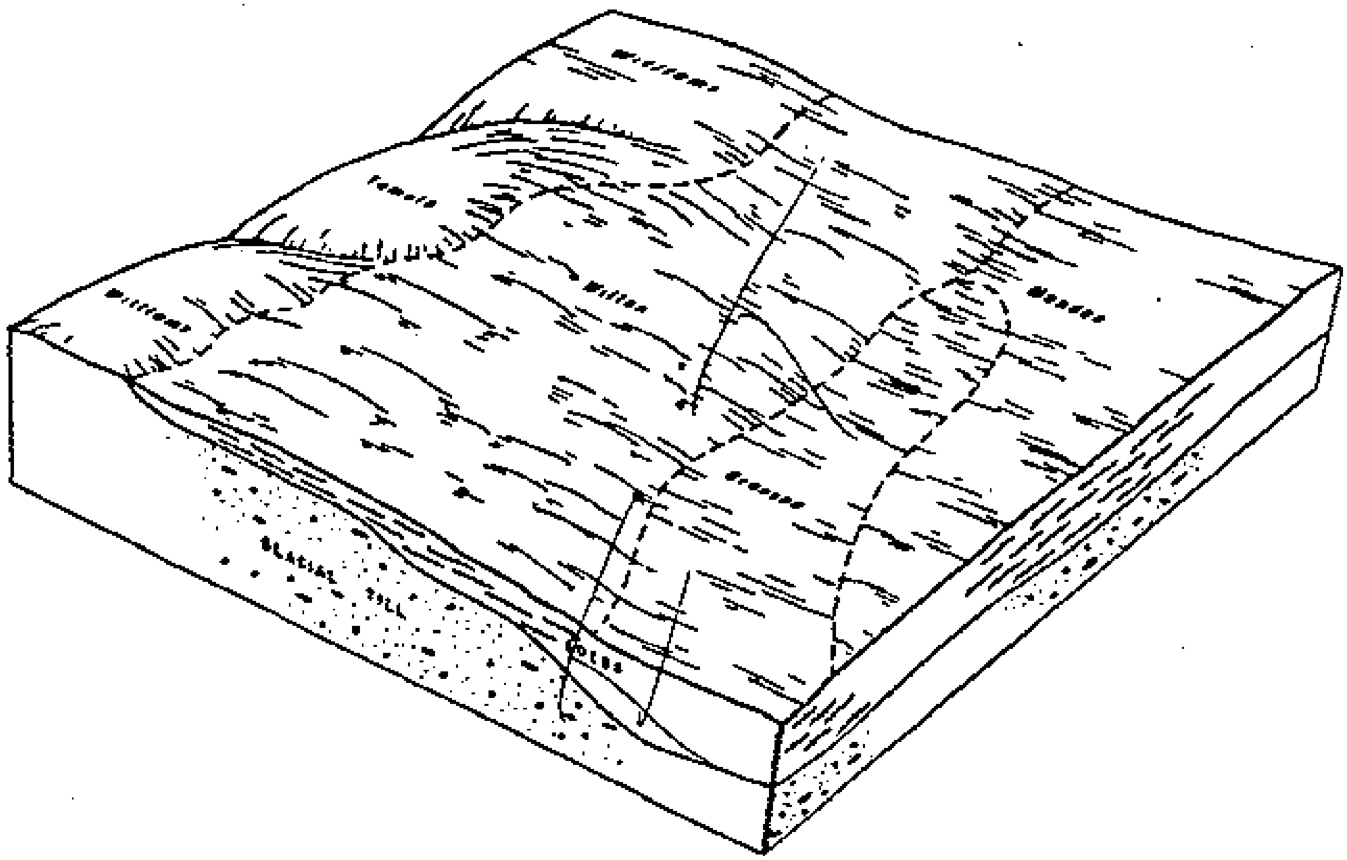
National Cooperative Soil Survey, USA, Arnegard Series, FWW-GBM 16 November 1978.

National Cooperative Soil Survey, USA, Bowbells Series, GBM 8 November 1978.

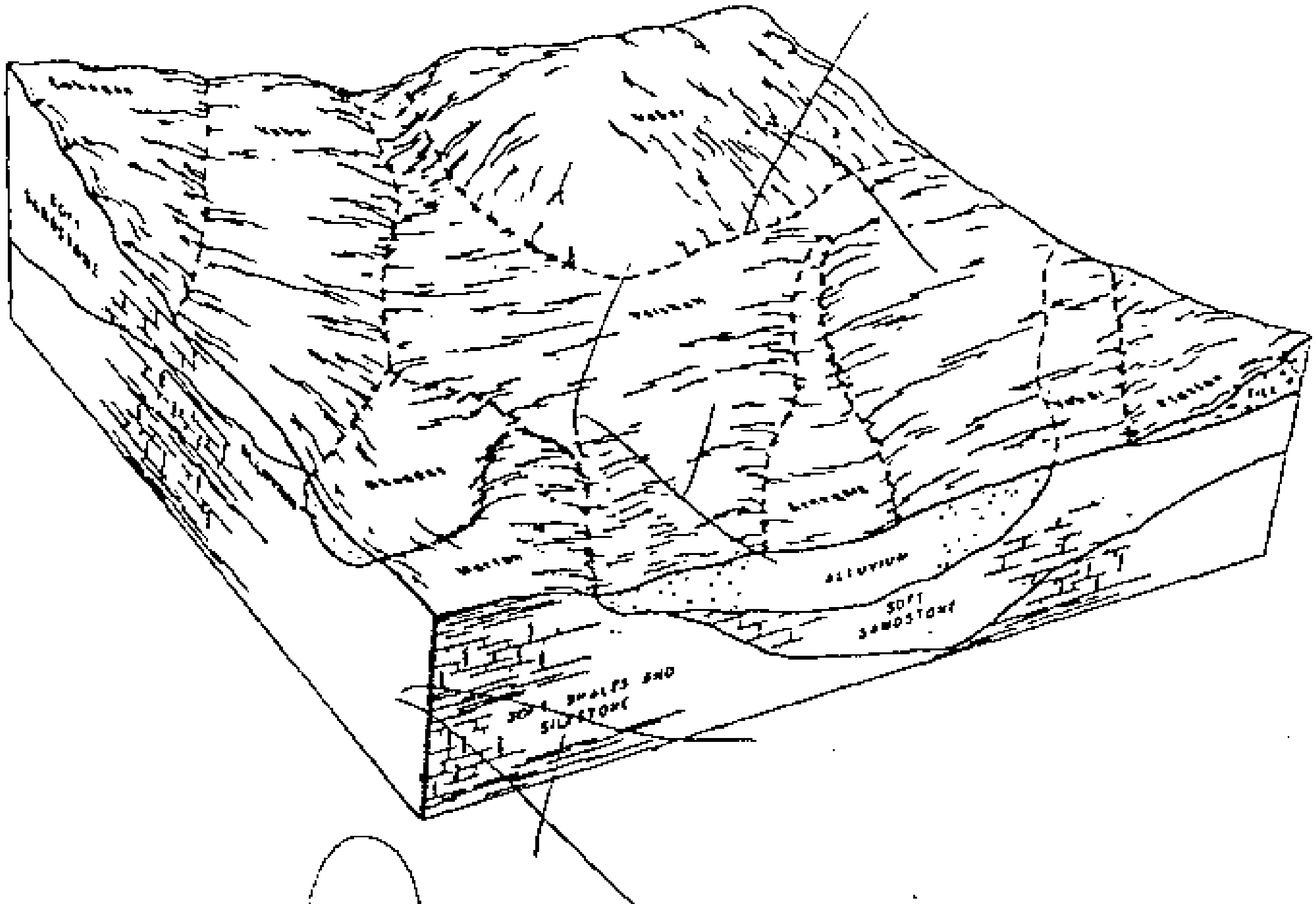
United States Department of Agriculture, Soil Conservation Service, North Dakota Important Farmlands, Bismarck, North Dakota.

Wright. M. Robert and Tillotson, Steven J., Soil Survey of Dunn County, North Dakota, issued April 1982.

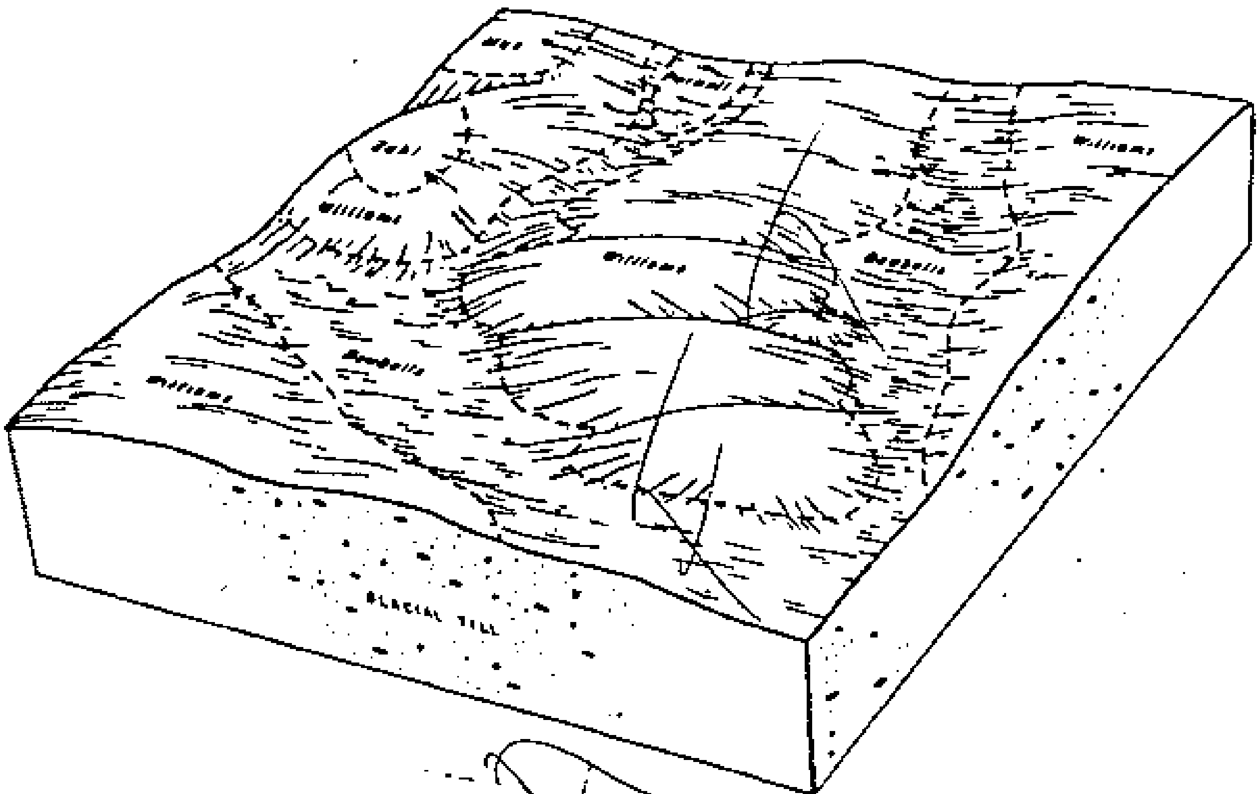
Brockman, Lester and others, Soil Survey of McLean County. North Dakota, issued June 1979.



Typical landscape position of the Wilton, Grassna, and Mandan soils and relationship to the surrounding soils.



Typical landscape position of the Arnegard soils and the relationship to surrounding soils.



Typical landscape position of the Bowbells soils and relationship to the surrounding soils.

Committee 6--Classification, Interpretation,
and
Modifications of Soils on Mine Spoils and Disturbed Soils
Summary of Research in MNTC Area

ILLINOIS

Jansen, I. J., A Pedologist's Perspective on Reclamation. Illinois Nining Institute, 1983?

Defines reclamation as "soil construction" which involves establishing a suitable surface configuration, selecting a suitable or best material, and suitable method of placing the material to avoid adverse physical stress. The paper contains specific information on methods of material placement and clear pictures of constructed soils that demonstrate desirable and undesirable properties.

Dunker, R. E., I. J. Jansen, and M. D. Thorne. 1982. Corn response, to irrigation on surface-mined 'land in western Illinois, Agron. J. 74: 411-414.

Studied affect of irrigation on Typic Udorthent mine soils that had been constructed using a wheel. One had topsoil replaced, the other did not. Irrigation significantly increased yields on the topsoil replacement for both years and for the nontopsoil treatment for the first year. Results indicate use of irrigation to relieve moisture stress is viable alternative if water quality is good.

Fehrenbacher, D. J., I. J. Jansen, and J. B. Fehrenbacher. 1982. Corn root development in constructed soils on surface-mined land in western Illinois. Soil Sci. Soc. Amer. J. 46:353-359.

Studied effect of B horizon replacement on corn root development in reclamation of mined land in areas of highly productive soils. Two constructed soils and an undisturbed Clarksdale soil were studied. B horizon replacement was accomplished with little scraper compaction. Results indicate that when B horizon material (Clarksdale) is carefully replaced, a more favorable rooting medium results as compared to newly replaced dragline spoil.

Jansen, I. J. and W. S. Dancer. 1981. Row crop yield response to soil horizon replacement after surface mining. Symposium on surface mining, hydrology, sedimentology, and reclamation. University of Kentucky, Lexington, KY 40506.

Evaluated the practice of soil horizon replacement as a reclamation practice. Response to horizon replacement varied but generally was positive if the natural soil horizons were of high quality.

McSweeney, K., I. J. Jansen, and W. S. Dancer. 1981. Subsurface horizon blending: an alternative strategy to B horizon replacement for the construction of post-mine soils. Soil Sci. Soc. Amer. J. 45:794-799.

Evaluated various combinations of substratum and B horizon materials as rooting media. Materials from an Albic Natraqualf (Darmstadt) and a Typic Haplaquoll (Sable) soil were studied in the greenhouse study. yields were best where topsoil was placed over a mixture of upper 3 m of material and was poorest where topsoil was-placed over the B horizon of the Darmstadt.

Snarski, R. R., J. B. Fehrenbacher, and I. J. Jansen. 1961. Physical and chemical characteristics of pre-mine soils and post-mine' soil mixtures in Illinois. Soil Sci. Soc. Amer. J. 45:806-812.

Evaluated the physical and chemical properities of solum and subsolum of the Sable and Darmstadt soils as a medium for plant growth. The Darmstadt has a natric horizon. Mixing the top 3 m appear to give the most favorable materials for use in constructing a post-mine soil. Results indicated that most chemical and textural properties of a solum and subsolum mixture can be predicted prior to mining. The pH was predicted using an equilibrium technique.

Dancer, W. S. and I. J. Jansen. 1981. Greenhouse evaluation of solum and substratum materials in the southern Illinois coal field: 1. Forage Crops. J. Environ. Quality 10:396-400.

Investigated the suitability of slightly acid Cl material and mildly alkaline glacial till 'for post-mine soil construction as an alternative to the very strongly acid, clayey subsoil material of the natural soils.

Indorante, Sam J., Ivan J. Jansen, and Charles W. Boast. 1981. Surface mining and reclamation: Initial changes in soil character. J. Soil and Water Conserv. 36:347-351.

Selected properties of disturbed soils were compared to nearby undisturbed soils (Weir, Stoy, and Wynoose). 'The properties of constructed soils reflected their pre-mine character and the method of soil construction. Constructed soils had higher bulk densities and lacked structure.

Indorante, S. J. and I. J. Jansen. 1981. Soil variability on surface mined and undisturbed land in southern Illinois. Soil Sci. Soc. Amer. J. 45:564-568.

Variability was compared between five different soil units on surface-mined land that were similarily constructed and three units of undisturbed landscapes (Wynoose, Weir, and Stoy series). Analysis of variance indicated more significant differences among the mine units than the undisturbed units but coefficient of variability for constructed units was similar to the undisturbed units. Pre-mine overburdened characteristics and methods of soil construction are useful guides in designing map units. (Weir silt loam.) Blending the Cl with B horizon appeared to be a variable alternative to liming the subsolum material.

INDIANA

Anderson, Christian Paul. 1983. Concurrent establishment of hardwood tree seedlings and low ground cover on reclaimed mineland. MS Thesis. Purdue University.

Anderson, C. P., P. E. Pope, W. R. Brynes, W. R. Chaney, and R. H. Bussler. 1983. Hardwood tree establishment in low pant cover on reclaimed mineland. Proc. 3rd Am. Conf. Better Reclamation Trees. Purdue University, Southern. Illinois University and Madisonville Community College.

Black walnut seedling survived better than red oak seedlings and individual container produced seedlings exhibited better survival than bare root seedlings. Herbicide application to reduce ground cover competition affectly increase black walnut survival.

Stein, Otto Robert. 1983. Erodibility and related Properties of three reclaimed surface mined soils. MS Thesis. Purdue University.

Stein, Otto R., Charles B. Roth, William C. Moldenhauer, and Daniel T. Hahn. 1983. Erodibility of selected Indiana reclaimed strip mined soils. Symposium of Surface Mining Hydrology, Sedimentology, and reclamation. University of Kentucky, Lexington, KY 40506-0046.

Bussler, Brett Hayden. 1982. Hardwood tree establishment in low plant cover on reclaimed mineland. Proc. 3rd Am. Cong. Better Reclamation Trees. Purdue University, Southern Illinois University, Madisonville Community College.

Bussler, B. H., W. R. Byrnes, P. E. Pope, and W. R. Chaney. In press. Properties of minesoil reclaimed fro forest land use. Soil Sci. Soc. Amer. J. 48.

Physical and chemical properties of minesoil were evaluated for suitability for reforestation. The natural soils were Ava (Typic Fragiudalf) and Parke (Typic Hapludalf). Chemical properties of minesoils were more favorable for plant growth than the natural soils, however, the reverse was true for physical properties.

IOWA

Henning, S. J., et al. 1982. Iowa coal project demonstration mine. Iowa . State Mining and Mineral Resources Research Institute (IS-EMRRI-17) Ames, Iowa, Annual Progress Report.

Goal of project is to restore capability of the land to be greater than or equal to the pre-mine soil. Research and progress concerns deep tillage for corn production, crop rotation, seed bed tillage, planting rates, fertility, and native grasses.

KANSAS

Research at the Center for Public Affairs, Kansas University, concerns inventorying abandoned mine land in conjunction with the Office of Surface Mining goals..

Hambleton, 'William W. and Jerome E. Welch. Environmental effects of coal surface mining and reclamation on land and water in southeastern Kansas. Kansas geological survey mineral resources series 7.

This is a study of soil and water environments of surface coal mine with comparisons to reclaimed and unmined areas. Principal soil is the Parsons silt loam. Results (wheat yields) indicate that mine soil with no topsoil replacement was comparable to natural soil. Replacing the A and B horizons may result in lower yields than if the horizons were mixed together or mixed with C horizon material. Mixing makes for a more homogenous constructed soil.

They suggest that water quality problems can be prevented by overburden analysis prior to mined overburden.

Fleming, Edward L. 1983. Notes and summary of heavy metal study in Cherokee County, Kansas. Soil Scientist, SCS, Salina, Kans.

Study concerns tailings (chat piles) from lead and zinc mining and milling and possible pollution by heavy metals (Pb, Zn, Cu, and Cd) in soils. A serious contamination exists along a northeast-southwest transect from the chat pile in accord with prevailing winds.

Lagerwerff, J. V., D. L. Brower, and G. T. Biersdorf. 1972. Accumulation of cadmium, copper, lead and zinc in soil and vegetation in the proximity of a smelter. Proc. Sixth Annual Conference in trace substances in environmental health, University of Missouri, Columbia, Missouri.

Showed a deterioration in quality of soil near smelter due to aerosol additions of material from the smelter.

MICHIGAN

Shetron, S. G. and J. J. Spindler. 1983. Alfalfa, Medicago sativa L., establishment in mine mill tailings. 2. root patterns of alfalfa in iron tailings and natural soils. Plant and soil 73:239-246.

Compared alfalfa growth in tailings to that of natural soil. In tailings, roots concentrated in clay layers; in coarse textured tailings, roots concentrated at the surface. Similar rooting characteristics were observed in the natural soil.

Shetron, Stephen G. 1982. Diversity of surface mine wastes and implementation of reclamation practices. Symposium on surface mining, hydrology, sedimentation and reclamation. University of Kentucky, Lexington, KY 40506-0046.

Suggest in revegetation process on mine tailings the following needs: (1) a texture map for planting seeding mixes, mulching, and equipment needs; (2) quantify color of material; (3) determine fertility needs; (4) locate possible wind and water erosion hazards; and (5) identify seasonal climatic patterns that may influence planting.

Shetron, S. G. 1983. Alfalfa, Medicago sativa L., establishment in mine mill tailings. I. plant analysis of alfalfa grown on iron and copper tailings. Plant and Soil: 73-227-237.

Shetron, Stephen G. 1978. Chemical composition of alfalfa (Medicago sativa, L.) grown on iron and copper mine mill wastes. pp. 311-318. In Surface Mining and Fish/Wildlife Ser. FWS/OBS, Morgantown, W. Va.

Alfalfa absorbed very high amounts of iron (1,099 ppm tops, aluminum (648 ppm tops) on iron tailings, copper (100 ppm tops), iron (1,040 ppm tops), and aluminum (716 ppm tops) in alfalfa grown on copper tailings. Summarizes properties of the materials and necessary management practices to overcome fertility problems and wind and water erosion problems.

Shetron, Stephen G. and Dorian A. Carroll. 1977. Performance of trees and shrubs on metallic mine mill wastes. J. Soil and Water Cons. 32:222-225.

Factors that contributed to variability in tree growth included compaction by heavy equipment, amount of rocks and late spring and early fall frosts. Hybrid poplars, European black alder and various willows proved to be the most suitable species.

Shetron, S. G., B. M. Hamil, M. F. Jurgensen, R. T. Segal, L. Jones, L. Lennox, and J. Prather. 1977. Establishing vegetation on Alkaline Iron and Copper Tailings. Report of Investigation 17. Geological Survey Division, Michigan Department of Natural Resources, Box 30028, Lansing, MI 48909.

Summarizes properties of the materials and necessary management practices to overcome fertility problems and wind and water erosion problems.

Cryderman, Joan M. and Stephen G. Shetron. 1976. Cation exchange capacity, calcium, *magnesium,* and pH changes in iron tailings as affected by vegetation. Research Notes No. 20. Michigan Tech. University, Ford Forestry Center, L' Anse, MI 49946

The CEC, Mg, 'and Ca increased in surface layer with time. They observed as much as a sevenfold increase in sands.

Chosa, James A. and Stephen G. Shetron. 1976. Use of willow cuttings to revegetate the "slime" areas of iron mine tailings basins. Research Notes No. 21, Michigan Tech. University, Fort Forestry Center, L'Anse, MI 49946.

Shetron, Stephen G. and Rodney Ritter. 1973. Evaporation of water from reclaimed copper stamp sands. Research Notes No. 8. Michigan Tech. University, Ford Forestry Center, L'Anse, MI 49946.

Potential water losses by evaporation averaged 0.41 inch per day in the surface 6 inches in summer.

Shetron, Stephen G. and Ralph Duffek. 1970. Establishing vegetation on iron mine tailings. J. Soil and Water Conserv. 25:227-230.

Fine textured layers within the planting root zone contributed to the successful establishment of grasses and legumes.

MISSOURI

Plant Materials Center is studying revegetation on acid mine soils.

NORTH DAKOTA

Can mined land be made better than before mining? North Dakota Energy Development Impact Office, Capital Building, Bismarck, ND 58502.

Contains discussion on North Dakota's regulation of strip mine reclamation and numerous reports of research studies.

Reclamation Research Summaries, USDA-ARS and NDSU Land Reclamation Research Center. 1983 and 1981. Northern Great Plains Research Center, P.O. Box 459, Mandan, ND 58554:

Leistritx, F. L. and T. A. Hertsgaard. 1980. Environmental, Economic and Social Impacts of a Coal Gasification plant in western North Dakota. Bull. 509, North Dakota Agricultural Experiment Station, North Dakota State University, Fargo, N. Dak.

Soils of study area include the Vebar-Tally, Morton-Rhoades-Cabba, Amor-Morton-Cabba, Flaxton-Williams, and Belfield-Grail-Rhoades soil associations. Report contains baseline data needed to assess impacts of the gasification plant.

Schroer, F. W. 1978. Characterization of coal overburden and strip-mine spoils in North Dakota. North Dakota Research Report No. 68. Soils Department, North Dakota State University, Fargo, ND 58102.

Characterized 18 soils and overburden material to support interpretations for reclaiming spoils from lignite mining in western North Dakota. (Mercer, Dunn, and Bowman counties).

Omodt, Hollis W., Fred W. Schroer, and Donald D. Patterson. 1975. The properties of important agricultural soils as criteria for mined land reclamation. Bull. No. 492. Department of Soils, Agricultural Experiment Station, North Dakota State University, Fargo, ND 58102

Reviews published and available data and present knowledge of the properties of soils important to farming in western North Dakota. Contains excellent color photographs of the soils.

Additional listing in attached bibliography.

OHIO

Results in Jefferson County, Ohio: Research on the hydrology and water quality of watersheds subjected to surface mining. A mining research contract report, December 1983, preliminary copy, Bur. of Mines, USDI.

Fair-point was the post-mine soil mapped on the 29-acre-watershed period. Objective of the study was to determine the effects of mining on land hydrology, sediment discharge, and water quality.

Postmining results in Muskingum County, Ohio: Research on the hydrology and water quality of watersheds subjected to surface mining. A mining research contract report, April 1983, preliminary report, Bur. of Mines, USDI.

Watershed on chiefly calcareous materials. The post-mine soil is Morristown, a loamy-skeletal, mixed Typic Udorthent.

Halley, Jay Franklin. 1981. Characterization and variability of topsoil and subsurface materials on a reclaimed surface mine watershed in eastern Ohio. M.S. Thesis, the Ohio State University, Columbus, Ohio.

Evaluated variability of topsoil and spoil materials characterized their properties. Topsoil and spoil were deposited in random manner resulting in heterogenous patterns of chemical and physical properties. Found no systematic or predictability in reclamation operations.

Hall, George F. 1977. Classification of five types of strip mine and implications for reclamation. Fifth symposium on surface mining and reclamation, Louisville, Ky.

Discusses the five proposed series to cover the range of mine soil materials in Ohio; Morristown, Fairpoint, Bethesda, Barkcamp, and Enoch.

Research proposal, J. M.Bigham.

Study concerns selected units of prime farmland in southeastern Ohio to compare physical and chemical properties between undisturbed and reclaimed mine soils, to evaluate crop yield response to soil replacement and construction practices, and to compare productivity between undisturbed and reconstructed mine soils.

WISCONSIN

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and
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NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

Fargo, North Dakota
May 3-7, 1982

Warren Lynn
, SCS, USDA, NSSL
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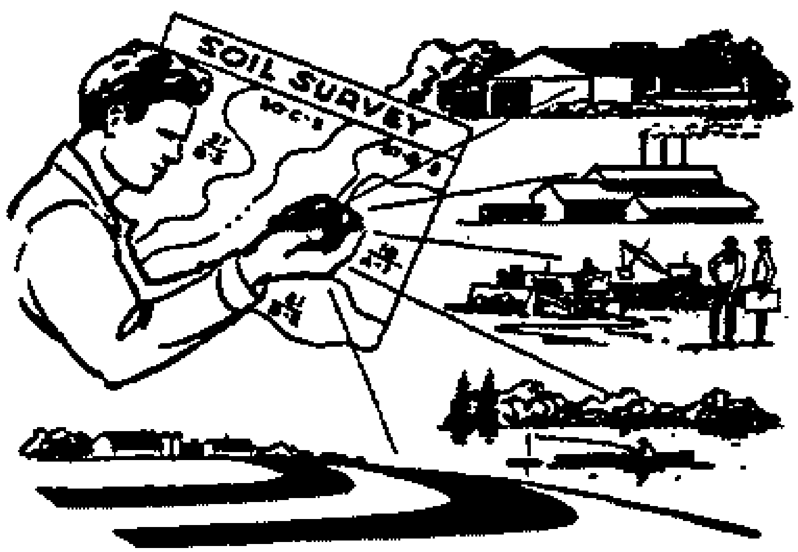
PROCEEDING&,,
NORTH CENTRAL REGIONAL
TECHNICAL WORK-PLANNING CONFERENCE
OF THE
NATIONAL COOPERATIVE SOIL SURVEY

FARGO, NORTH DAKOTA
May 3-7, 1982



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
Fargo, North Dakota
May 3-7, 1982

AGENDA

May 3, 1982

Monday - P.M.

8:00-10:00	Registration and socializing - Room 198 (Poolside)

May 4, 1982

Tuesday - A.M.

7:45- 8:00	Welcome Dr. H. Roald Lund, Director North Dakota Agricultural Experiment Station - state Room
8:00- 9:45	Meeting of Committee 1 - Improving soil survey techniques and modernizing soil surveys - state Room Meeting of Committee 5 - Educational activities for soil resources and land use - University
9:45-10:00	
10:00-10:30	
10:30-11:45	
11:45-12:45	

Tuesday - P.M.

12:45- 2:45	
2:45- 3:00	
3:00- 3:30	
3:30- 5:00	
8:00- 9:00	

May 5, 1982

Wednesday - A.M.

7:45- 9:45	
9:45-10:00	
10:00-11:45	
11:45-12:45	

Wednesday - P.M.
12:45- 2:45

2:45- 3:00

3:00- 3:30

3:30- 5:oo

8:00- 8:45

8:45- 9:15

May 6, 1982

Thursday - A.M.
7:45- 9:45

9:45-10:00

10:00-10:45

10:45-11:45

11:45-12:45

Thursday - P.M.
12:45- 1:15

1:15- 1:45

1:45- 2:45

2:45- 3:00

3:00- 4:oo

4:00- 5:00

REGISTRANTS
NORTH CENTRAL REGIONAL TECHNICAL WORK PLANNING CONFERENCE
Fargo, ND
May 3-7, 1982

James L. Anderson
James A. Bowles
Lawrence E. Brown
John I. Brubacher
James R. Culver
Robert G. Darmody
Leon B. Davis
Raymond T. Diedrick
Marvin L. Dixon
Sylvester C. Ekart
Thomas E. Fenton
Charles S. Fisher
Leon R. Follmer
Willie J. Forest
Donald P. Franzmeier
Jon C. Gerken
Richard L. Guthrie
Milo I. Harpstead
Keith K. Huffman
Ivan J. Jansen
Mark S. Kuzila
Gilbert R. Landtiser
Gerhard B. Lee
Gary D. Lemme
Maurice J. Mausbach

Richard E. Mayhugh
A. Steven Messenger
F. Ted Miller
Gerald A. Miller
Paul E. Minor
Delbert L. Mokma
Hollis W. Omodt
Donald D. Patterson
Robert A. Pope
Gerald J. Post
Morris W. Roningen
Walter E. Russell
Richard H. Rust
Stephen G. Shetron
H. Raymond Sinclair Jr.
Miles W. Smalley
Neil E. Smeck
James H. Thiele
Bruce W. Thompson
Michael L. Thompson
Robert I. Turner
E. Jerry Tyler
David G. VanHouten
Kenneth D. Vogt
Earl E. Voss

COMMITTEE ASSIGNMENTS
NORTH CENTRAL REGIONAL TECHNICAL WORK PLANNING CONFERENCE
Fargo, ND

May 3-7, 1982

Committee 1 - Improving Soil Survey Techniques and Modernizing Soil Surveys

Chairman - Keith K. Huffman
Vice Chairman - Mark S. Kuzila

Raymond T. Diedrick
Thomas K. Divney
Sylvester c. Ekart
Charles S. Fisher
Leon R. Follmer
Gary P.

Christine Lietzau
Paul E. Minor
Douglas B. Oelmann
Robert S. Pollock
William E. Roth

Committee 5 - Educational Activities for Soil Resources and Land Use

Chairman - Robert A. Pope
Vice Chairman - A. Steven Messenger

Orville W. Bidwell
Lawrence E. Brown
Christian J. Johannsen
Gerhard B. Lee
Gary D. Lemme
Gerald A. Miller
Gary A. Steinhardt

Committee 6 - Soil Correlation and Classification (Including Forest Soil Classification)

Chairman - Robert I. Turner
Vice Chairman - Richard H. Rust

James G. Bockheim
James A. Bowles
Louis L. Buller
Robert G. Darmody
Thomas E. Fenton
Milo I. Harpstead
Ronald J. Kuehl
Jerry D. Larson
D. Rex Mapes
Richard E. Mayhugh
A. Steven Messenger
J. Wiley Scott
Eunice A. Steidinger
Neil W. Stroesenreuther
Bruce W. Thompson
Larry D. Zaveskey

Committee 7 - Using Soil as a Medium for Treating Wastes

Chairman - E. Jerry Tyler
Vice Chairman - Steve R. Base

James L. Anderson
Joseph E. Yahner
Ted M. Zobeck

Committee 8 - Classification, Interpretation and Modification of Soils on Mine Spoils and Disturbed Soils

Chairman - Stephen G. Shetron
Vice Chairman - Wells F. Andrew

Lester J. Bushue
Richard L. Christman
Joseph B. Fehrenbacher
Ivan J. Jansen
Gerald J. Post
Kenneth D. Vogt
Earl E. Voss

North Central Regional Technical Work-Planning Conference

Fargo, North Dakota
May 3-7, 1982

Minutes

The 1982 Biennial meeting of the North Central Regional Work-Planning Conference was called to order by Chairman Don Patterson at 7:45 AM, May 4.

Dr. H. Roald Lund, Director of the North Dakota Agricultural Experiment Station, welcomed the conference to North Dakota. He also presented a background on the state and North Dakota State University.

Chairman Patterson appointed a committee to select a site for the 1986 conference. The next conference will meet in 1984 at Manhattan, Kansas. The committee chairmen were instructed to present summaries of their respective committee to the general session on Thursday.

The purpose of the conference was discussed by Gerald Post. The main intent of the workshop is to bring together North Central States representatives of the National Cooperative Soil Survey for discussion of technical questions. Other goals and rules governing the work-planning conference were also presented. Mr. Post was representing Mike Stout who was unable to attend.

Dr. Richard Guthrie, National Leader for Soil Taxonomy of the SCS, distributed copies of bylaws for the National Cooperative Soil Survey Conference. The bylaws provide and define the name, participants, committees and biennial meetings for the conference. The steering committee evaluates recommendations of the of other committees and follows up on those recommendations. A suggestion was made to have an odd number of members on the steering committee rather than the present 12 members. It was further suggested to include a member from the private sector of soil scientists. The bylaws do not provide guidelines for regional meetings. Each regional conference adopts its own purpose, policies and procedures, provided these do not conflict with the bylaws and objectives of the National Cooperative Soil Survey Conference.

The conference met in general session again at 3 PM to hear Professor Neil Smeck discuss computer storage and retrieval of soils information. A slide program was presented based on examples from Ohio. It showed how data could be inputed into a computer from a card similar to SCS form 232 using standard soil abbreviations. The code input has the capability to come out in a narrative. It was suggested that each state have its own data base.

The states that have some digitized maps include Indiana, Iowa, Michigan, Missouri, Nebraska and Ohio. Types of digitizing discussed include the following methods: Grid cell, Line segment, Polygonal enclosure and Automatic scans. Grid cell, line segment and polygonal enclosure are systems whereby data is entered manually. The grid cell has been used in Indiana; the line segment has been used in Ohio; and the polygonal has been used in Minnesota.

Separate meetings were held on Wednesday morning for state and federal representatives. At 3 PM, Chairman Don Patterson presented a program on "sing soil survey information for farm assessment. Some states are using market value to assess land and others are using soil potential. One crop can be the basis for land evaluation where it is the main crop throughout the state. The best method to assess land is what the people will accept. In the future, greater demands will be made for soil interpretation when evaluating land. A warning was made not to oversell soil surveys in land assessment. Many other factors must be considered. Of historical significance, it was noted that Dr. Kellogg wrote a book on procedures used for assessment in 1935.

The conference met in general session again at 10 AM on Thursday. Dr. Richard Guthrie discussed the changes in horizon nomenclature. These changes are described in chapter 4 of the Soil Survey Manual. It was emphasized that genetic horizons are not the equivalent of the diagnostic horizons of Soil Taxonomy. The new mode of horizon nomenclature is more of an international system.

At 12:45 PM Mr. Ted Miller, Principal Correlator for the SCS Northeast National Technical Center, gave a report on activities in his region. In 1978 the Northeast Cooperative Soil Survey Conference was held at the University of Connecticut. In 1980 the conference was located at Cornell University. An agenda of the last conference was distributed. A concern raised by Mr. Miller was the loss of soil scientists after soil surveys have been completed. It is difficult to replace positions needed for basic soil services.

At 1:15 PM Dr. Guthrie gave a Washington report. Many soil scientists from other countries have expressed to Dr. Guthrie their high regard for the National Soil Survey. An item of concern is the misunderstanding of the map unit by the public. An effort needs to be made to instruct the users of soil surveys about the inclusions within a map unit. It was also noted that some soil surveys no longer meet present standards and remapping may be necessary.

At 1:45 PM Chairman Patterson made a motion that the minutes of the 1980 Work-Planning Conference be approved. The minutes were approved as written by Secretary Omodt. Chairman Patterson asked for comments pertaining to old business. No comments were presented. Each committee chairman was then asked to make a 15 minute report of his respective committee. A written report of each committee has been included in the proceedings of this conference. A summary of the oral presentation of each committee chairman is as follows:

Committee 1. Improving Soil Survey Techniques and Modernizing Soil Surveys.
Keith Huffman, Chairman

Soil depths between 5 and 8 feet is a "no mans" land. Both soil scientists and geologists have disregarded this zone as their responsibility. Future interpretations may require that soil scientists study soils at these depths. We also need to become more aware of computer programs. Soil scientists will need to be proficient in understanding, developing formats of storage and retrieval of soil survey data. The committee recommended that governmental agencies should avoid contract soil mapping wherever possible. It also recommended that charge 5 concerning guidelines for contract mapping be dropped. Changes in the soil survey program were suggested to better serve the needs of future users.

Recommend committee be continued

Committee 2. Soil Interpretations. Jim Culver, Chairman

We will continue to evaluate the format used for interpretations. It was the consensus of the committee that good correlation was being done on prime farmland between states. The criteria for identifying "similar soils" in this region seems to be adequate. As soil survey activity moves more into heavily forested areas, the survey needs to improve its contribution to woodland interpretations.

Recommend committee be continued

Committee 3. Soil-Water Relations, including movement in soil landscapes.
Report by Michael Thompson for Chairman, Don Franzmeier

The steering committee presented no charges for this committee. Two general topics were discussed: First, the concepts of soil moisture that are presently outlined in chapter 4 of the Soil Survey Manual and second, the proposed regional project to take the place of NC-109. The committee did not officially address the question of whether to continue as a committee.

Committee 4. Soil Potentials. James Thiele, Chairman

Both benefits and concerns were discussed with soil potentials, Soil potentials are the most accurate soil suitability rating that can presently be developed for decisionmakers. A major concern was the change in rating with change in costs. The states involved with soil potential do not intend to publish the ratings in the soil survey reports.

Recommend committee be continued

Committee 5. Educational Activities for Soil Resources and Land Use.
Robert Pope, Chairman

The committee recommended that a list of films, slides and tapes as teaching aids be developed. The list would be made available to members of this conference. The availabilty of soil courses within the SCS is being evaluated.

Recommend committee be continued

Committee 6. Soil Correlation and Classification. Robert Turner, Chairman

Chemical data must continue to be used in soil classification. However, soil morphology in the field must be the main criteria to classify soils.

Recommend committee be continued

Committee 7. Using soil as a medium for treating wastes. Jerry Tyler, Chairman

The inclusions listed in map unit descriptions are helpful in locating sites for disposal systems. A bibliography on soils and waste disposal systems was distributed to the members of this conference.

The subject is very important to soil interpretations, however the number of members involved in this committee is small. The committee recommended that this committee disband.

Committee 8. Classification, interpretation and modification of soils on mine spoils and disturbed soils. Stephen Shetron, Chairman

Several states have established series for mine wastes materials. The series are classified as Udorthents. Compaction and its effect on plant establishment and water relations in spoils material is a major concern. Many areas are site specific. It was recommended that salt water spills from oil wells be added as a charge to this committee.

Recommend committee be continued.

Secretary Larry Brown extended an invitation to the members of this conference to attend the 1984 meeting in Manhattan, Kansas.

Chairman Don Patterson announced that the 1986 meeting will be held in Ohio. He went over some of the recommendations that this conference suggested. A study of the tilled horizon was a major recommendation. The general session was officially dismissed.

Larry Brown
secretary

MINUTES

NCR-3 SOIL SURVEY COMMITTEE MEETING

Holiday Inn
Fargo, North Dakota
May 5, 1982

The 1982 committee meeting of NCR-3 was held in conjunction with the North Central Regional Technical Work Planning Conference of the National Cooperative Soil Survey. Chairman Rust called the meeting to order at 7:45 a.m. Members and friends of NCR-3 present were:

Illinois	I. Jansen*, R. Pope, S. Messenger
	R. Darmody, L. Follmer
Indiana	D. Franzmeier*
Iowa	T. Fenton*, G. Miller, M. Thompson
Kansas	No representative
Michigan	D. Mokma*, S. Shetron
Minnesota	R. Rust*, J. Anderson
Missouri	No representative
Nebraska	M. Kuzila
North Dakota	D. Patterson*
Ohio	N. Smeck*
South Dakota	G. Lemme*
Wisconsin	G. Lee*
SCS-USDA	M. Mausbach
CSRS-USDA	C. Smith
Administrative Advisor	c. Krueger

*Official representative to NCR-3

Chairman Rust appointed Anderson to represent NCR-3 at the concurrent meeting of Federal agency personnel.

Minutes of the November 11, 1981 meeting at St. Louis, Missouri were approved with the correction of the spelling of "Darmody."

Comments by C. Krueger: Dr. Krueger stated that NCR-3 is scheduled to terminate on September 30, 1983. A letter from Chairman Rust to Dr. Krueger reviewing NCR-3 accomplishments during the last 3 years and justifying continuation of the committee is needed by February 1, 1983.

Comments by C. Smith: Dr. Smith reported that the Federal budget for fiscal 1983, if adopted, would provide more dollars for agricultural research than the 1982 budget. Funds available for special grants have been reduced compared to funding for competitive grants. The CSRS staff is scheduled for a 40 percent reduction by September 15, 1983. Apparently the current Congress does not understand the role of CSRS in the project review and fund allocation process. Budget projections for fiscal 1984 are being developed. Areas of soil science where funds for fundamental research may be increased are (1) soil genesis rates and (2) comparative rates of erosion and soil genesis. The rationale used by the Office of Management and Budget in budget development is not clear; numerous changes in funding have been made in some areas. Conservation of soil resources, maintaining soil productivity and soil-water relationships are areas of research being considered for funding.

Chairman Rust appointed a committee of Lee and Smeck to nominate (1) a secre-

goal for completion of the Illinois soil survey is 1991. A new soil association map should be available by summer. A supporting bulletin is expected to be published within the next year. The new map and bulletin will replace Bulletin 725, Soils of Illinois.

Indiana - No report.

Iowa - concern was expressed about the deletion of textural modifiers in published county reports and in official series descriptions. Agreements have been made with personnel in nine counties for soil map computerization for land valuation.

Kansas - No report.

Michigan - A new state soil association map was completed in December 1981. The Michigan soil survey is scheduled for completion in 1997. A current problem involves the development of map units for county soil surveys on which suitable forest interpretations can be based.

Minnesota - A general soil map (scale = 1:1,000,000) is expected to be available by December 1982. A geographic data base, developed with county personnel, will be operative in Olmsted County by summer. Sufficient software will be available for local use in areas of soil testing, modeling soil erosion losses, tillage management, and soil management modeling. IBM-PC equipment will be used locally. Color or black and white graphics will be available. Funds appropriated by the state for soil survey must be used, in part, for development of a data base for county use.

Missouri - No report.

Nebraska - A state soil association map. based on the quadrangle sheet maps (scale 1:1,000,000) will be compiled and published. The Nebraska soil survey is scheduled for completion in 1990.

North Dakota - No report.

Ohio - The Ohio soil survey is scheduled for completion in 1990. Counties which are not on a cost share basis are being bypassed for the present. Some updating of older published county soil survey reports is being done where a minimum of remapping is required. Remapping requires about 75 percent of the time needed for progressive mapping.

South Dakota - The South Dakota soil survey is scheduled for completion in 1987. Seventeen counties are currently in various stages of completion. A joint project on grazing potential is being conducted in cooperation with SCS-USDA and FS-USDA.

Wisconsin - Twenty six soil scientists are employed by SCS-USDA. Mapping in 42 counties has been completed. The Wisconsin soil survey is scheduled for completion about 1994.

Lee reported that Soil Survey Horizons was incorporated about 1962 by F. Hole, M. Beatty and G. Lee. The Soil Science Society of America Board of Directors was asked to assume responsibility for the corporation but declined because of manuscript review procedural differences for the two publications. Manuscript review Policy for Soil Survey Horizons is now set by the corporation. The Soil Science Society of America Board of Directors will continue its present role in the publication of Soil Survey Horizons but will not assume editorial responsibility. A motion by Lee (second by Miller) to transfer about $70.00 in the corporation treasury to the Soil Science Society of America account was-carried. Presumably the corporation established to administer Soil Survey Horizons will be dissolved.

Jansen was elected secretary of NCR-3 for 1983 and Mokma was elected to a 3 year term (1983-85) on the Regional Soil Taxonomy Committee by acclamation.

A motion by Fenton (second by Lemme) that current NCR-3 officers be appointed to the 1983 Steering Committee of the National Cooperative Soil Survey Work Planning Conference was carried. Chairman Bidwell (1983) and Secretary Jansen (1983) will serve as representative and member-at-large, respectively, to the 1983 Steering Canmittee. Action on this item was taken in response to a prior request by R. Guthrie.

A motion by Smeck (second by Lemme) that Chairman Rust send a letter to Dr. Krueger by February 1, 1983 summarizing recent and proposed activities of NCR-3 and requesting continuation of the committee was carried.

The next meeting of NCR-3 is tentatively scheduled for November 1983 at St. Louis, Missouri in conjunction with Technical Committee NC-109.

Meeting adjourned at 11:45 a.m.

Submitted by

Donald D. Patterson

Donald D. Patterson
Acting Secretary
NCR-3, 1982

Federal Agencies, Separate Session
NORTH-CENTRAL REGIONAL WORK PLANNING CONFERENCE

Fargo, North Dakota
SCS Meeting, May 5, 1982
Gerald Post, Chairman

A list of topics for this session was distributed.

1. Scheduling priority of initial field reviews.

   A correlator from the Technical Service Center may not participate in initial field reviews. Plans have been made for participation in all comprehensive reviews.

2. FY-83 budget and required information.

   The intent of this budget is to provide funds for basic soil services. Less emphasis will be on mapping acreage. State and local funds are for mapping and not basic soil services. A reduction in the number of published surveys will help absorb the pay raise. Sixty surveys will be published instead of the normal 100.

3. Providing Basic Soil Services.

   Basic Soil Services will have added emphasis as noted in the above item #2. Basic soil services more accurately describes activities of soil interpretations.

4. National High Altitude Photography Program.

   A map was distributed showing high altitude photography coverage.

5. Submission of completed soil survey sheet material after July.

   After July 1 all atlas sheets will be submitted to Fort Worth cartographic unit. They will not be sent through the Midwest National Technical Center. Copies will be sent from Fort Worth to MNTC. It was noted that type overlays are suited to digitizing. Photo background cannot be used with the scanning method.

6. Service available from CART0 after July.

   Subject was covered under item #5.

7. Hydric soils.

   Dr. Guthrie lead this discussion on this subject. We may need a qualifying statement when we classify a soil as hydric. Aquic taxonomic classification and wetland classification are not synonymous.

8. Soil water table depths and soil moisture regimes.

   The soil needs to be saturated with water only for a few weeks to qualify as having a water table.

9. Flooding classes and prime farmland.

Some soils classified as prime farmland do have a flooding hazard.

10. Status of land capability classes and subclasses.

The capability classification will be described in the National Soil Handbook.

11. Mapping and classification of mined lands.

This subject was discussed in a committee report.

12. Map units of the soil survey - NSH Sec. 301.5.

This section of the NSH needs to be updated. Chapter 5 of the Soil Survey Manual should help define the map unit.

13. Remapping-modernize-update older published soil surveys.

Some older surveys need to be remapped. A limited number of copies are available for some older surveys. These reports can be reprinted for about $10.00 per copy.

14. Colored covers for published survey.

Colored covers are not recommended.

15. Should texture triangle be in manuscript?

We may put the textural triangle in the manuscript.

16. Engineering data table in manuscripts.

There are only a limited number of columns in the engineering table. No other columns can be added.

17. Chapter 4.

The Principal Soil Correlators and Dr. Robert Grossman are working to complete chapter 4.

Improving Soil Survey Techniques
and Modernizing Soil Surveys

Committee 1

Charge 1

Predict future uses of soil surveys and needs of users.

A. Soil surveys of the future will be used increasingly for non-agricultural uses.

B. Users of soil surveys will need data for depths in the range of five to eight feet. If we do not have reliable soil data for this depth range, we should strive to attain such data. See Attachment 1.

C. Soil surveys are being used increasingly for forest land management - by both governmental agencies and private enterprise - such as the ecological classification system for national forest lands.

D. Soil. surveys will be used ever increasingly for natural resource inventory programs. Many, if not all, will require computer storage of soil data. Users of soil surveys will be retrieving soil data in a variety of formats. Soil scientists will need to be proficient in understanding and developing formats of storage and retrieval of soil survey data.

Recommendations for Charge 1

1. Guidance from the national office is needed to clarify responsibility for providing soil data in the five to eight foot zone; such as the scientific field of soil scientists or geologists, guidance for investigating, describing, and interpreting this “no-man’s lard.” Providing

L. States should develop a workload analysis and long range soil survey program for at least ten years hence. This program is to include plans for project soil surveys as well as basic soil services.

Second Part of Charge 2

Have we placed too much emphasis on facilitating soil surveys and too little emphasis on meeting future needs of users?

A.' The majority of Committee 1 answers yes on this question. Indications are that the answer a state would give depends on the degree of once-over completion.

8. It is suggested that regardless of what has happened in the past, we in NCSS must give high priority to working with user/potential user groups to help them develop a better understanding of soil surveys.

Recommendations for Charge 2

1. Consideration should be provided for flexibility of design of soil survey formats based on user needs.

   It is important for soil scientists of all appropriate agencies to work together in designing soil surveys for forested regions, especially where counties are 90 percent forested. This working together, creating an awareness, and designing formats will greatly enhance the use of soil surveys.

2. Federal and state agencies should develop field mapping criteria for forestry management and encourage improved forestry sections.

3. All agencies in NCSS should be more keenly aware of the need for adequate field studies, research, and hard data collection during and after the operation stages of project soil surveys. We need to reinforce many estimated soil properties with hard data.

Committee 1

Charge 3

Determine if basic field operations are adequately covered in the soil scientist's training or if such training requires more emphasis. Are the basic procedures for conducting field operations adequately stressed during the individual's training period so that the person is not likely to falter when he/she becomes a party leader and responsible for training and supervising others?

A. Supervisory soil scientists should emphasize professionalism, dedication, and enthusiasm to party leaders. This same esprit de corps should be given to new trainees by party leaders.

B. Trainers need to develop a training atmosphere which will permit communication with the trainee and yet enable the trainee to work and get experience at his/her personal rate of accomplishment. Quality control is the day-by-day responsibility of party leaders.

C. Trainers need to always look critically at the use and scheduling of their own time.

D. More attention should be given to developing a customized Individual Development Plan (IDP) for each trainee. The IDP needs to be flexible and open-ended. Addideve64 training and/or courses may be needed to "beef up" an area of weakness. IDP's should be canprehensive and include basic field operadeves. IDP's and other training guidelines should include a variety of exposures in soil resource areas, management, and soil survey operadeve skills.

E. Training for basic field operadeves should emphasize -

    operadeves management and scheduling
    determinadeve of goals
    mapping techniques
    collecdeve of hard data

F. Cvesider self-improvement techniques, follow-up, or refresher training for party leaders so they may better develop alternadeves to overcome soil limitadeves. The self-confidence and experience in developing alternadeves are important in preparing text manuscripts.

G. Educadeveal institudeves have courses that now, or could be adapted to, provide direcd or indirecd hands-ve experiences in field mapping operadeves.

Recommendations for Charge 3

1. Federal and stade agencies/institudeves can work more closely with technical staff and administrators to ensure high quality IDP's, technical guidance, and training of soil scientists.

Recommendations continued

2. Past and present training of soil scientists has produced highly trained and competent soil scientists; however, the present and future needs of soil scientists will be to have training in computer science, interpreting research data, budget and finance preparation, and working closely with allied professions such as engineering and geology.

Committee 1
Charge 4 continued

General Comments on Charge 4

Many states have contracts (cooperative agreements) with local and/or state units of government to cost-share in project soil surveys. Agencies should be constantly aware of these commitments and place the highest priority on completing these long range obligations. Future project commitments should be approached more cautiously - that is, sign contract obligations to start new surveys only after thorough evaluation of agency capabilities through long range plans/workload analysis.

Recommendations for Charge 4

1. It is recommended that national guidelines be developed for states to use in developing long range budgets, strategies to deal with reduced soils staff, projecting once over completion dates, and alternatives to providing basic soil services - support of published soil surveys.

2. It is recommended that top priority national emphasis be given and resources be earmarked for the acquisition of high quality aerial photography for the NCSS program.

Committee 1

Charge

Develop guidelines for quality control of progressive soil surveys, particularly where contract soil mapping is involved.

A. Responsibility for quality control of contract soil mapping rests with the governmental agency contracting soil mapping.

B. utilize other governmental agencies, i.e. - U.S. Forest Service - to assist in providing quality control for contract mapping. Take advantage of experience from other agencies when identifying responsibility for quality control.

C. Field reviews, mapping inspections, and technical visits serve to provide quality control for NCSS work by governmental agencies; therefore, similar/identical approaches for contract mapping - if it is to meet NCSS standards - should also be used.

D. Develop quality control models for counties with contract soil mapping. Address all known objectives of the soil survey such as quality control, the use of word processing equipment, digitization of soil maps, computer programs to recall data, coordination of mapping/joining with adjacent surveys, etc.

E. Quality control for contract soil mapping should be designed to meet the needs of the survey area. Complex survey areas will need a greater degree of quality control than simple areas.

F. Only one state in the North Central Region has had experience in contract soil mapping - and this was with another governmental agency.

Recommendation for Charge 5

1. It is recommended that governmental agencies should avoid contract soil mapping wherever possible.

2. It is recommended that this charge be dropped from Committee 1.

Committee 1

Charge 6

Related items of concern and/or interest.

Discussions and interest of Charge 6 were directed toward modernization efforts for earlier published soil surveys. A summary of discussions is as follows:

A. Examples of modernization programs for earlier published soil surveys.

1. Updating soil interpretations by ordering new tables and combining with explanatory material. Some states have used field trips to evaluate the mapping before proceeding to order new tables.

2. Transferring soil data from old line maps to aerial photography.

3. A modernization program for older soil surveys that ranges from an informal update of-interpretations to a fiat fee per township/county for a modernized soil survey.

4. One state (Ohio) is testing a formal evaluation program, by state and federal agencies. They use the evaluation program to develop alternative modernization programs. Local officials select the program to best meet their needs. Cooperative agreements are than developed for the appropriate program. (See Attachment 2)

B. Modernization programs should emphasize studies, research, and hard data needed to back up our interpretations.

Recommendations for Charge 6

1. National guidelines/criteria (examples of evaluation forms) should be developed for states to use in evaluating earlier published soil surveys. The guidelines/criteria would include a technical, in-depth evaluation of all aspects of the survey as well as identifying user needs.

2. States should be encouraged to develop long range plans and workload analyses for modernizing earlier published soil surveys.

Committee 1

Overall Summary and Recommendations

1. It is recommended that Committee 1 continue in the North Central Regional Work Planning Conference.

2. It is recommended that the number of charges be reduced, possibly to 4.

3. Charge 2 of Committee 1 overlaps with Committee 2. Recommend Charge 2 be included with Committee 2.

4. Recommend Charge 4 be combined with Charge 3.

COMMITTEE 1 MEMBERSHIP

NAME

Raymond T. Diedrick

Thomas K. Divney

Sylvester C. Ekart

Charles S. Fisher

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Attendance During Committee 1 Discussions and Presentations

NCR Work Planning Conference
May 4, 1982

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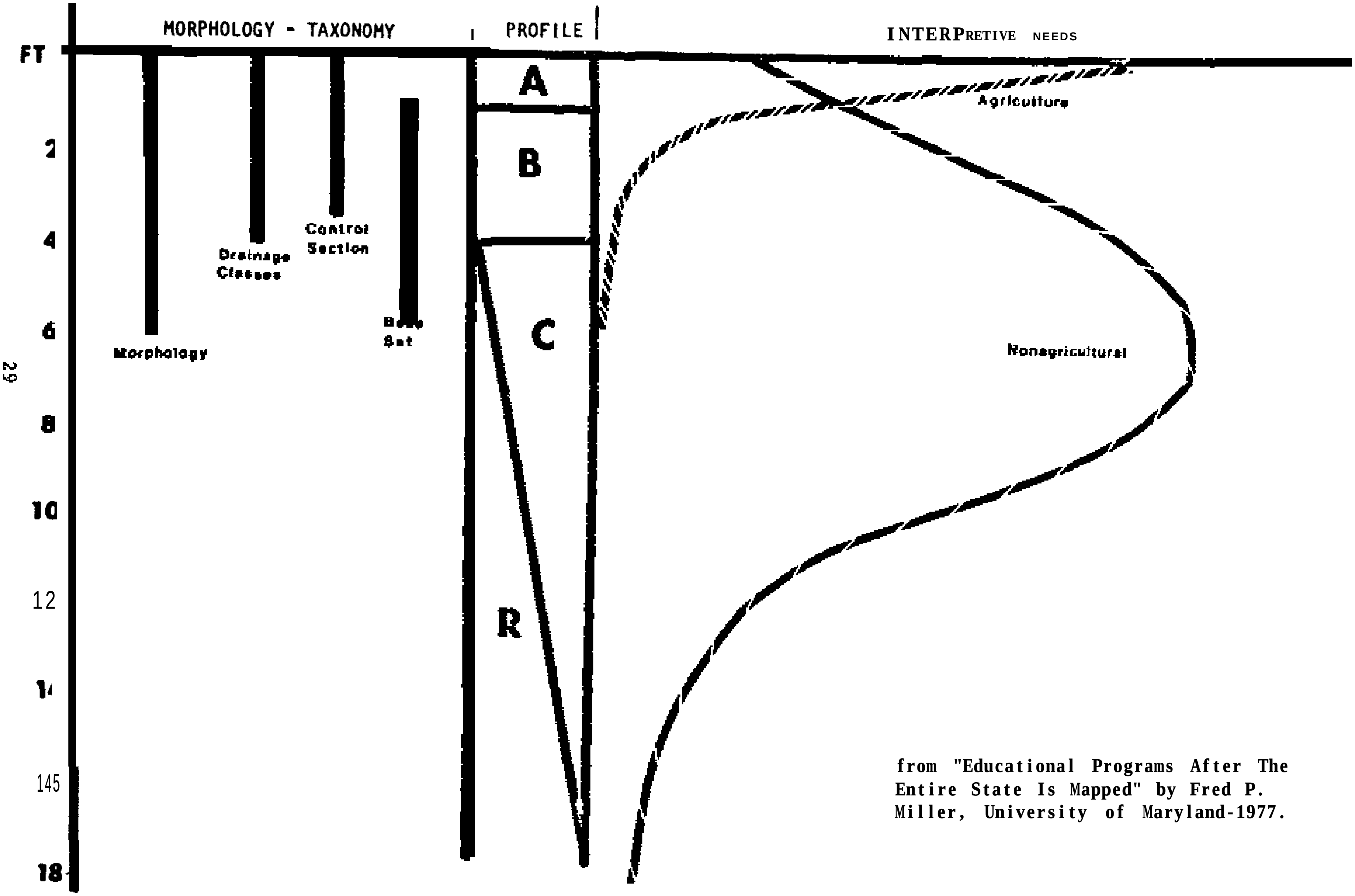
Ivan J. Jansen	University of Illinois	Urbana, Illinois
Leon R. Fallmer	Illinois Geological Survey	Champaign, Illinois
Neil E. Smeck	Ohio State University	Columbus, Ohio
H. Raymond Sinclair	Soil Conservation Service	Indianapolis, Indiana
Don Franzmeier	Purdue University	West Lafayette, Indiana
Miles W. Smalley	Soil Conservation Service	Huron, South Dakota
Raymond Oiedrick	Soil Conservation Service	St. Paul, Minnesota
Richard Russ	University of Minnesota	St. Paul, Minnesota
Keith Huffman	Soil Conservation Service	Columbus, Ohio

Figure 1. FREQUENCY OF SOIL USE AND INTERPRETIVE REQUESTS BY SOIL DEPTH



from "Educational Programs After The Entire State Is Mapped" by Fred P. Miller, University of Maryland-1977.

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Attachment 1

Attachment 2

EVALUATION REPORT OF A SOIL SURVEY IN
______________ COUNTY
FOR A MODERNIZATION PROGRAM

county: ____________________

Publication date: soil **survey** ________
supplements ________

Oate of evaluation: ____________________

Members of technical team:

Name	Agency
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

Other agency personnel and local leaders participating in the evaluation:

Name	Agency
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

Background summary of local interest and correspondence leading up to this evaluation:

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I. **Background Data for Present Soil Survey:**

A. Acres in county ..... ______________________

B. Gate soil survey published ______________________

C. Year field work completed . . ______________________

D. Year field work began .. . . ______________________

E. Scale of field maps ... ______________________

F. Scale of published maps . ______________________

G. Are original field sheets available? ______________________

II. **Needs and User Identification:**

A. Identify and list major current end potential needs for a soil survey.

______________________ ______________________

______________________ ______________________

______________________ ______________________

______________________ ______________________

______________________ ______________________

______________________ ______________________

B. List major current and potential users of the soil survey.

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III. soil Maps:

A. Are primary soil lines separating major landscapes accurate? .... ______

B.

V. Laboratory and Field Investigation:

A. List kinds of laboratory data available.

B. List kinds of laboratory data and research studies needed.

C. Have complete pedons been sampled and analyzed? ....

If so; identify.

D. Have special analyses been made? ..

If so, what type?

D. Are concepts for series used in the present soil survey the same as today's concepts?

E. Do taxonomic units permit the development of autonomous map units?. ... ______

If no above, explain.

F. List map unit design used ...... ______

G. List the estimated range of reliability for existing map units of all major soils.

VII. Soil Correlation:

A. Is recorrelation needed to support new or revised soil interpretations? .. ______

If yes above, explain.

______

______

______

______

______

B. Is recorrelation needed to combine similar soil series and map units with similar interpretations? ... ______

VIII. Soil Interpretations:

A. Do present soil interpretations meet the current needs of local users? . ______

If no above, what specific soil interpretations are needed?

______

______

______

______

______

B. Were RATINGS guidelines used to prepare soil interpretations in the present soil survey and/or supplements? .. ______

C. Is technical data available to interpret from guidelines in the RATINGS program? . . . . ______________

If not, explain.

____

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____

IX. Map Unit Descriptions:

A. Do map unit descriptions adequately characterize soils in the map unit? . . . . ______________

B. Do map unit descriptions meet the needs of major users? . . . . ______________

If no above, explain.

____

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____

____

C. Are new map unit descriptions needed? ______________

O. List the appropriate percentage of soils in cropland . . . . ______________

E. List the appropriate percentage of soils used for pasture/hayland . . . ______________

F. List the appropriate percentage of soils used for woodland . . . . . . ______________

G. List the appropriate percentage of soils used for urban and other uses . . . . ______________

X. Identify Other Areas Evaluated with Comments:

XI. Summary - Recommendations:

A. Is a soil survey modernization program recommended? . . . . ______

B. If yes, list recommendations of the team (work to be completed in a modernization program).

North Central Regional Work Planning Conference
of the National Cooperation Soil Survey
May 3-6, 1982
Fargo, North Dakota

Committee 2 - Soil Interpretations

Background:

1. There were 6 of the 12 members assigned to this committee at the conference.

2. Most of the committee work was accomplished by correspondence prior to the conference. Excellent responses were received from committee members. Special assignments were made on selected charges to those members who had a strong background and interest in the charge.

3. Roy Smith, Dick Johnson, Tom Fenton and Bob Grossman also provided input to committee activity prior to the conference.

Charges: The steering committee identified seven charges for the committee to address. Charges 4 and 7 were identified as low priority for committee action. Charge 4 overlaped with activity in Committee 6 on Soil Classification and Committee 8 on Interpretation of Mine Spoils. Charge 7 also was related to Committee 6 Soil Classification Charges.

Some features of guide are:

1. Allows a dual assignment of subclass, ie., for local "se.' Only the dominant limitation is assigned in summary of data, le., NRI. Presently, dual assignments of subclass are being used in some published soil surveys.

   Recommendations - A program has been developed to reference important farmland criteria of soils with the data on the SCS Soils-5. This program is designed to identify potential problems and to assist in uniform placement of soils as prime farmlands, both within and between states. A program of similar design is needed to evaluate the placement of soils in land capability classes and subclasses. This would assist in more uniform application of the capability system. For example, occasionally flooded, well drained soils are capability class I in one state and IIw in another. Also, clarification is needed on the term pasture vs. cropland.

Charge 2: Continue evaluation of format and content of the soil interpretations section of published soil survey reports.

General discussions points are:

1. Revised options of the range section in published soil surveys. This revision uses a brief table on production by range sites and provides more information at the map unit level. Some states are eliminating the wildlife tables and using discussion by soil associations as the basis for this section.

2. Cover pictures - Often difficult to get good quality photographs suitable for cover. Usually requires a lot of time input. Use of color for cover photographs was discussed. There is some question on approval needed for uses of color cover photographs.

   Recommendations - Several line drawings suitable for cover to be prepared in color. Each state may have option to "se these line drawings if desired.

3. Sketches and Charts - There is a feeling that charts, block diagrams, sketches and etc., add to the presentation of data in the soil survey.

   We need examples of these types of illustrations which are acceptable for published soil surveys as reference, ie., block diagrams, soil-geology cross sections, soil-plant relationship and etc. Several states have prepared booklets of available block diagrams. A similar guide of block diagrams grouped by Major Land Resource Areas consolidated by NTC would be helpful.

4. Soil characterization data - This type of data was included in some earlier soil surveys. Many present day users have need for this type of data. There are some tables now included in the surveys which may contribute less to the user than presentation of soil laboratory data on key selected pedons. Some committee members have reservations about putting in tables of laboratory data, but did favor summarization of data in the form of regression equations, graphs or summary of tables.

   Recommendations - Option be given to states to include soil characterization data for pedons of major and contrasting kinds of soils in the survey area.

5. Modified guide to map units - Revisions in manuscript format have resulted in elimination of the "Guide to Map Units." Numerous requests have been made from users of the soil survey to have a listing of soil map units and various interpretative groupings assigned. Kinds of interpretative groupings assigned to map units would include capability units, range sites, woodland groupings and windbreak groupings.

<u>Recommendations</u> - The interpretative groupings for each soil map unit would be added to the soil survey. This could readily be done in most surveys by adding to the soil legend in the front of the survey.

6. Comments on feedback of new format from users who are technical people working with farmers and ranchers.

6.1 Not pleased with the many tables and the fact that the narrative portion describing what's included in the tables is not directly with them.
6.2 Desire to have discussion by range sites, capability unit and etc.

7. Need for uniform terminology to describe land forms or physiographic and landscape elements series and mapping unit descriptions. For example, the following terms seem to be used by different states for similar settings:

till plains vs. moraines
till plains vs. ground moraines
outwash plains vs. valley field

Some general guidelines are available in handouts prepared by MNTL, Western regional publications and reproduction of Ruhe's work.

There are some terms defined in the glossary for published soil surveys which do not agree with the SCSA glossary. Bob Turner plans to review these differences and bring them to the attention of the MNTC for appropriate action.

<u>Recommendations</u> - A comprehensive guide to be developed by MNTC showing illustrations identifying landscape elements and explanation of terminology common to this region to assist uniform discussion of land forms or physiographic positions and in discussing landscape elements in the soil survey.

8. Use of terms to describe limitations or suitability of soils for various land uses.

Do we want uniform guidelines on the use of limitations and suitability terms for land uses in soil survey manuscripts? Presently, some states are using terms, such as "few limitations, some limitations," and etc., rather than slight, moderate, severe and very severe in discussion on capability. Similar situations on consistency occur on the use of terms, such as good, fair, poor and very poor.

The committee, in general, was in favor of each survey area having the option to use the kinds of limitations and suitability terms which most appropriately array the soils.

9. General comments on scs-Soils-5:

1. Concern on use of 8000 series of Soils-5's for uses other than Natural Resources Inventory (NRI).

   Presently, the 8000 series indicate that the interpretations are not coordinated and are not to be used in published soil surveys.

2. Ratings are given for some uses which are generally not applicable. Example includes soils in depressional areas being assigned a rating for grassed waterways.

   Remarks: Should the SCS Soils-5 note that the practice is generally not applicable or not needed rather than to leave the user the impression that this may be a common practice.

10. Use of productivity index in published soil surveys.

Some states, such as Ohio, North Dakota and Illinois, have developed state productivity indexes and other states, such as Minnesota, are in the process of developing these indexes. Most states, at this time, are not in favor of including a productivity index in the published soil survey.

Charge 3: Examine criteria for identifying and interpreting "similar soils." Are these criteria being applied uniformly across the region?

The criteria for identifying and interpreting "similar soils" in this region appears to be adequate. Material prepared by Roy Smith, provides a good summary of similar and dissimilar soils. This material has been used in training sessions and sent to state staffs for use.

These criteria are generally applied uniformly at the mapping unit level. The discussion of similar soils in the introductory paragraph of the series description is often not consistent. There is a question of the value to the user in talking about similar soils at the series level. Iowa has developed a worksheet to assist in determination of similar soils (Attachment No. 1).

Charge 4: Define soil properties and ranges of properties significant to selected uses without regard to taxonomic unit. In mined land reclamation, for instance, the removal and replacement of soil materials, according to soil physical and chemical properties, is far more important than is segregation of materials by series and/or horizon. Does the same reasoning apply to other uses?

This was not considered a high priority charge by the committee. Several committee members were not in agreement with the principal of defining soil properties and ranges without regard to taxonomic considerations. Historically we have done our best to describe the kinds and percent of soils in a map unit, classify them and then make the needed soil interpretations. Mined land reclamation areas usually present a difficult and complex problem of trying to handle as soil series. Some states have established soil series for these situations where the kinds and arrangements of soil materials were somewhat homogeneous. Map unit descriptions of these areas need to do a good job of describing the important soil properties and their range. Present guidelines on use of soils classified at levels above the series will result in no computer-stored or available interpretation tables in the published soilsurvey (NSH-PART 1, Section 407).

In general, the committee does not feel this reasoning applies to other uses.

Charge 5: Determine if prime farmland criteria is being applied uniformly across the region. If not, how can better coordination be achieved?

Overall, committee members feel there is good coordination on identification of prime farmland across the region. There are specific instances on borderline soils or application of guidelines which need additional clarification. The computer check of prime farmlands being developed will assist in identifying and resolving areas of differences.

The following are items for consideration:

1. A proposed policy classification on Important Farmland Mapping as an addition to the National Inventory and Monitoring Manual was sent to all state conservationists for review on March 23, 1982 with a reply date of April 2, 1982.

Discussion points in this policy are:

1.1 The manual addition emphasizes that each prime farmland map unit must be documented by the computer check or by a statement of reasons why the map unit is prime farmland when the computer check shows that it does not meet all the prime farmland criteria. According to the handbook material, no statement is needed if a map unit qualifies for prime farmland by the computer check, but is not included on the state list. Does this need to be documented?

1.2 This policy contains a statement indicating the percent of inclusions for each soil map unit be given on the prime farmland map legend. The kinds and amount of inclusions in each map unit is given in the soil map unit description.

Recommendations - States have the option of not including the percent of inclusion for each map unit in the legend of Important Farmland Maps.

2. The "se of qualifying statements, such as "where drained" continue to give problems. "Where drained" is used with some aquic subgroups, but certainly with not all. More coordination is needed along this line. There is resistance to apply "where drained" to all soils with aquic moisture regimes.

3. The present computer program will prepare a list of all phases and slopes of a series by soil survey areas. Many of these phases do not occur in the survey area. The computer prime farmland program should be coordinated with the SCS-5's and the printout for the county show only the phases of series correlated.

Charge 6: Continue development of guidelines and criteria for interpretation for forest management.

Several committee members expressed an increased interest in this area as soil survey activity is moving more and more into heavily forested areas. In many of these areas, moves are underway toward more active and more intensive management of the forest resources. The new National Forestry Manual provides improved guidelines on interpretations for forest management.

1. Slope position and aspect are factors that influence site index - often as much or more than the soil. One committee member indicated in his experience with foresters, they were interested in groups of soils. Examples are well drained loamy soils, moderately well drained clayey soils. Therefore, the present data on the SCS Soils-5 is adequate. There is a need to do a better job of relating landscape position, slope shape, aspect and geomorphic - geologic relationships in map unit descriptions, especially as these factors relate to forest productivity, Mapping unit descriptions should contain paragraphs describing vegetation, including overstory, understory communities and successional tendencies. Soil association descriptions should mention forest cover types or plant communities.

2. There was expression by some committee members that forestry interpretations for soil surveys should not contain technical guide information. There are many methods of woodland management and objectives, thus, it is often difficult to get agreement on what to include in this respect. Presently, several states are in the process of publishing soil surveys where woodland is a major land use.

3. Some members of the committee indicated more comprehensive interpretative tables for woodland management in areas where forest is an important land use. Some states, such as Minnesota and Montana, have developed special woodland soil interpretative tables for soil manuscripts. These kinds of tables are not able to be prepared from the data on the SCS Soils-5's.

   Recommendations -There is a need to include more information on relating landscape position, slope. aspect in map unit descriptions. Map unit descriptions describing vegetation, including overstory and understory communities and successful tendences are needed. Two draft outlines (Attachment No. 2 and No. 3) for preparing these interpretations are included in this report.

4. The principal user for one soil survey area in South Dakota is the Forest Service. They are going to incorporate as much information as possible in the map unit description to meet their needs. In this cooperative survey, the map unit design has been agreed upon by both agencies. Attachment No. 3 was prepared by Darwin Hoeft, USFS.

Charge 7: Reliable interpretations at the series level often is difficult to come by because information on soil behavior for a particular use is lacking. Are family level interpretations justified in these cases? What are the limitations of family interpretations?

The committee is not aware of specific instances which prompted the first part of Charge 7. If reliable interpretations at the series level are difficult to obtain, how could we expect interpretations at the family level to be an improvement? Our greatest reliability should be at the series level. Where broad general interpretations are desired over a large geographic area, the use of family level interpretations certainly has its merits. However, where specific soil interpretations are needed for small selected areas, the use of family level interpretations may provide insufficient data for evaluation.

Other discussion items -

1. Kinds of techniques and procedures used to collect and maintain crop yield data for soil survey.

Crop yield data is one of the most used tables in the soil survey. There is a need to have reliable measured crop yield data to support our manuscript tables. Accurate crop yields are also essential in the development of soil potentials. There is a need to have an easy system to store and evaluate collected yield data.

Each state in the region was contacted to get some background information on how crop yield data is being developed. A brief summary is as follows:

Procedure	states
l-Crop yield data collected mostly by soil scientists during visits during field mapping and/or using university data.	6
Z-Collection of data by measurement of plots	5
3-States using some type of form to collect crop yield data	4
4-States using some type of production index (and one in process of development).	3

A data collection sheet for storage and evaluation of crop yield results has been prepared. Attachment No. 4 is a data sheet developed by Keith Young and Nebraska for computer input of crop yield data.

Recommendations - States to be encouraged to collect measured crop yield data. Crop yields on comparison of eroded and noneroded soils, comparison of yields on different slope classes, comparison of yields by management levels and etc. are needed.

2. Hydric soils of the United States -all states are required to respond to National Bulletin No. 430-Z-7, dated January 4, 1982.

This list contains many soils which are not hydric soils by definition. This is of concern to most committee members because hydric soils could equate to "wetlands." There are a number of soil series classified as Mollic or Typic Ochraqualfs, Aquolls and Haplaquepts, listed as hydric soils. They are also listed as prime farmland which is not compatible to wetlands.

The definition of the term "significant periods" needs to be more accurately defined. Fish and Wildlife Service's publication, "Classification of Wetlands and Deepwater Habitats of the United States," says that one group of wetlands is areas where the substrate is predominantly undrained hydric soil. This implies that there are drained hydric soils. They also refer to drained hydric soils in several places. This seems to be a rather basic contradiction.

The publication "Hydric Soils of the United States" states that drained soils are not considered hydric soils; however, a chart in a publication entitled "Wetlands and Deep Water Habitats", in the March-April 1982 issue of Soil Conservation shows drained lands as hydric soils. This conflict of interpretation needs to be resolved.

Hydric soils should be limited to soils which are presently poorly or very poorly drained and/or to soil wetness classes 5c and/or 5d and meet the requirements of saturated at or near the surface with water for significant periods during the growing season.

3. Laboratory data:

   1. M. Mausbach has summarized the status of computer based data system by soil series. (Attachment No. 5) provides an excellent overview on the current status of the computer based data system.

   2. Bob Grossman has prepared a data sheet recording information which could be utilized by technical users. (Attachment No. 6) Some committee comments noted part of the data is now on SCS Soils-5. Others had some reservation of using only one value rather than a range of values as given on the SCS Soils-5.

Recommendations - Committee charge at next conference to be to finalize a data sheet similar to the one developed by Bob Grossman.

Summary of Recommendations:

1. That Committee 2, "Soil Interpretations" be continued as a committee of the 1984 North Central Regional Work Planning Conference.

Charge 1: Continue development of criteria to determine soil capability class.

2. Recommendation - A computer program be developed using the NSH criteria to evaluate the placement of soils in land capability classes and subclasses. Similar to the one on prime farmland.

Charge 2: Continue evaluation of format and content of the soil interpretations of published soil survey reports.

3. Recommendation - Cover photograph - Line drawings or illustrations suitable for use as a cover page be developed for optional use by states.

4. Recommendation - Option be given to states to include soil characterization data for pedons of major and contrasting kinds of soils in the survey area.

5. Recommendation - Map units similar to the guide to soil interpretative groupings be listed for soil map units in one area. ie., such as the soil legend in the front part of the survey.

6. Recommendation - A guide be developed showing illustration, identifying landscape elements and explanation of terminology for use in soil survey reports.

Charge 5: Determine if prime farmland criteria is being applied uniformly across the region.

7. Recommendation - States have the option of not including the percent of inclusion for each map unit on the lgend of Important Farmland Maps.

Charge 6: Continue development of guidelines and criteria for interpretation for forest management.

8. Recommendation - There is a need to include more information on relating landscape position, slope, aspect in map unit descriptions. Map unit descriptions describing vegetation, including overstory and understory communities and successional tendencies are needed.

   Two draft outlines for preparing these interpretations are included in this committee report.

Other:

9. Recommendation - Crop Yield Data - States be encouraged to collect measured crop yield data. Crop yields on comparison of eroded and noneroded soils, different slope classes, different management levels and etc., are needed. A data collection sheet for storage and evaluation of crop yields results have been prepared.

10. Recommendation - Soil Data Sheet change to next conference - A data sheet by soil series has been prepared by Bob Grossman, NSSL. Includes physical and chemical data, water relationships. fertility levels. Committee change at next conference to be to finalize a data sheet similar to the one developed by Bob Grossman.

Submitted by: Jim Culver, Committee Chairman

Committee members:

Frank Anderson
*Jim Culver, Chairman
*Marvin Dixon
"Jon Gerken, Recorder
Carl Trettin
Rodney Harner
*Maurice Mausbach
John Nixon
Alexander Ritchie
*Walter Russell
"Miles Smalley

*Committee members in attendance at NCRWPC, Fargo, North Dakota

Other individuals contributing to the committee session at the NCRWPC, Fargo, North Dakota.

Names

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Gerald Miller
H. Raymond Sinclair
Gary D. Lemme
Delbert L. Mokma
Leon B. Davis
Gilbert R. Landtiser
Keith Huffman
Willie Forest
Mark Kuzila
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John Brubacher
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Robert Turner
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Jay Carta
Norm Prochnow
Jim Thiele
Gerhard B. Lee
Ted Miller
Paul Minor
Bruce W. Thompson
Steve Nessenger
Stephen G. Sherman

SIMILAR - DISSIMILAR SOILS WORKSHEET NO. 1

COUNTY, IOWA SOIL SURVEY

CLASSIFICATION	SERIES	MANAGEMENT FACTORS % SLOPE T	WATER - TABLE	PERMEABILITY'	AW(	% ORGANIC MATTER	FLOODING	CAPABIL SUBCLAS
Example								
Aquic Argiudolls								
fine - silty, mixed	Nevin	o-2	20-40'	M	H	3.5-4.5	R	I
fine - montmorillonitic	Adair	9-14	1..o-3.0'	S	H	2.0-3.0		IVe
	Arispe	5 - 9	2.0-4.0'	MS	H	3.0-4.0		IIIe
	Grundy	2-5	1.0-3.0'	S	H	3.0-4.0		IIe
	Mahaska	o-5	2..o-4.0'	M	H	3.5-5.0		I-IIe

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Attachment No. 1

SIMILAR - DISSIMILAR SOILS WORKSHEET NO.

COUNTY, IOWA SOIL SURVEY

Map Unit	Similar Soils in Map Unit	Dissimilar inclusions in Map Unit
23C2 IIIe)		Adair, Clarinda (IVe) (IVw)

The following is a rough draft prepared by Walt Russell outlining the interpretations needed for timber management:

I. Species Suitability and Potential Productivity

A. Vegetative Community or Habitat Types

B. Successional Tendencies

C. Important species

1. Natural
2. Suitable for introduction

D. Potential Productivity

1. Site Index
2. Volume growth (preferable cu.ft./acre/year)
3. Expected variability within the unit

E. Regeneration - Establishment of New Stands

1. Methods
2. Ease or difficulty of establishment
3. Nature of expected problems

F. Potential biomass production, in tons per acre per year

G. Windthrow Hazard

II. Silvicultural Activities

A. Timber Harvesting

1. Local haul road and log landing location

a. Limiting factors
b. Degree of limitation

2. Equipment operability

a. Alternative kinds of equipment
b. Operating periods
c. Limiting factors
d. Degree of limitation

3. Total Tree Harvesting

a. Limiting Factors
b. Degree of Limitation

B. Regeneration

1. Mechanized site preparation and planting equipment

a. Limiting Factors
b. Degree of Limitation

C. Erosion

D. Use of Prescribed Fire

E. Use of Chemicals

F. Other

The above should be considered a very preliminary rough draft outline. It has had some input from foresters, but is in need of further review and testing by forest managers.

March 1982
Darwin Hoeft, USFS
Custer, South Dakota

SUGGESTIONS FOR IMPROVING THE CONTENT AND FORMAT OF PUBLISHED SOIL SURVEYS

1. Suggest omitting soil fertility ratings for timbered soils. Most timbered soils have a low fertility rating, as they have thin or no Al horizons. A shallow soil with a 6-10 inch Al horizon is often rated as medium in fertility hut has a low site index. A deep timbered soil is generally rated as low in fertility, but has a higher site index than the shallow soil. Fertility ratings can be misleading when compared to production potential.

2. Mapping unit descriptions and interpretation tables should indicate if a particular soil has fractured bedrock or evidence of rock structure above consolidated bedrock. A deep soil listed as 5 feet or more to bedrock may actually have fractured bedrock at depths of 2-3 feet. This can he misleading to the user of a soils report, as one would likely assume rocky material is deeper than 5 feet. The fractured material at 2-3 feet could increase road costs, but, at the same time, provide base material to strengthen the roadbed.

3. Site index information should include identification of the site index curve, as there may be several site index curves for the same species. There have been proposals to use cubic feet/acre instead of site index.

4. Indicate type of logging equipment normally used in the survey area in the woodland management section. Identify major parameters used to determine equipment limitations, such as slope, wetness and soil texture.

5. Indicate kind of limitation, such as seasonal high water table or droughty soils, in the woodland management tables.

6. Suggest interpretations in the woodland management tables pertaining to soil compaction and landslide potential. Indicate why the mapping unit has a problem.

7. Include amounts of ground cover needed to keep soil erosion within tolerance limits. This interpretation could apply to clearcuts, skid trails and landings which have no appreciable timber canopy. Perhaps this is too specific for a published survey.

8. Suggest a separate range production interpretation table for timbered mapping units. This table could estimate the forage production potential from understory species by timber density classes. The timber density classes could be based on amount of timber canopy, such as 0-35% canopy, 35-70% canopy and 70-100 canopy or basal area classes.

9. Wildlife interpretations similar to Table 11 in the Soil Survey Report of the Taylor River Area, Colorado, may be more useful to a land manager. A copy of Table 11 is attached.

10. Soil series could be linked to habitat types. Example: The Citadel and Vanocker soils are associated primarily with the Pondersoa Pine - Juniper Habitat type. Perhaps a statement similar to the example could be included in the mapping unit descriptions.

11. Some users have indicated that photos of a soil unit and related site vegetation would be beneficial. Printing costs may restrict use of more photos.

12. Suggest interpretations pertaining to revegetation of disturbed areas, such as cut and fill slopes. Qualitative classes, such as slight, moderate and severe, could be used. Also, indicate why the mapping unit has a revegetation problem, such as shallow, droughty soils.

Attachment

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

SCS-SOI-1
4-81

SOIL-CROP YIELD DATA

KEYING INSTRUCTIONS: DUPLICATE SAMPLE NUMBER ON ALL LINES

Line 1

SAMPLE NUMBER			KIND OF PLOT	SIZE OF PLOT	LOCATION			AGENCY	DATE		
ST	CO	ID			X COORD.	Y COORD.	OTHER DESCRIPTION		MO	DY	YR

Line 2

SOIL IDENT	SOIL SYMBOL	SOIL NAME	SOIL IDENT. AT SITE Y-N

Line 3

SOIL INFO	INTERP RECORD NUMBER	USDA TEXTURE	SLOPE (PCT)	FLOODING	OTHER PHASE CRITERIA

Line 4

OTHER SOIL INFO	EROSION	A HORIZON		ORGANIC MATTER (PCT)	pH	ROOTING DEPTH (IN)	SLOPE LENGTH		SLOPE		ASPECT	K FACTOR
		COLOR	THICKNESS (IN)				THRU SITE (FT)	ABOVE SITE (FT)	KIND	SHAPE		

Line 5

WEATHER	MOISTURE RESERVE		PRECIPITATION DURING GROWING SEASON													DROUGHT DAMAGE	WATER DAMAGE	R FACTOR
	AT PLANTING	AT START OF GROW SEAS	QUAL	BY MONTH														
				1	2	3	4	5	6	7	8	9	10	11	12			

Line 6

CROP DATA	MULTI CROPPED Y-N	CURRENT CROP	CURRENT CULTIVAR (Variety)	FIRST PREVIOUS CROP	SECOND PREVIOUS CROP	THIRD PREVIOUS CROP

Line 7

CROP DATA (Cont)	PLANTING INFORMATION						HARVEST INFORMATION							
	DATE			TIMING	RATE LB/AC	ROW SPAC	DATE			TIMING	CROP YIELD	UNIT MEAS	RESIDUE T/AC
	MO	DY	YR				MO	DY	YR				

Line 8

CROP MGT.	COMMERICAL FERTILIZER					ORGANIC MATERIALS			TILLAGE	WEED CONTROL			INSECT DISEASE CONTROL			
	LB/AC			OTHER		MANURE		CROP Y-N		CHEM Y-N	NUM CULT	CROP DAMAGE	CHEM Y-N	KIND TREAT	NUM APPLIC	CROP DAMAGE
	N	P	K	KIND	LB/AC	T/AC	KIND									

Line 9

CROP MGT. (Cont)	OTHER DAMAGE	CONS PRACT	IRRIGATION			DRAINAGE		C FACTOR	NAME OF RECORDER
			Y-N	TYPE	ADEQUACY	Y-N	CROP DAMAGE		

USDA SOIL-CROP YIELD DATA
Instructions for Completing
Form SCS-SOI-1

Line 1

A. Sample number.

1. State code use the 2 character alphabetic FIPS code, e.g., VA.

2. County code use the 3 character numerical FIPS code.

3. Site identification number within county. Set up a sequence of numbers for each county.

B. Kind of plot.

Enter one of the following codes:

1 = Yield measurements in commercial farm fields.

2 = Yield measurements in field trials of special treatment practices (fertilizer field trials, variety trials, conservation tillage trials).

3 = Yield measurements of small research plots at experiment stations (variety tests, fertilizer tests).

4 = Yield estimates.

C. Size of plot.

Enter width x length in feet, e.g.; 4 x 10.

D. Location.

Use a map such as a 7½° quad, aerial photograph or soil survey to record the location.

1. X coordinate. Enter latitude north. Separate degrees, minutes and seconds with a hyphen. e.g., 25-05-03.

2. Y coordinate. Enter longitude west, e.g., 108-25-49.

3. Other location description, e.g., NE¼ Sec 12, T3IN, R11W.

E. *Agency.*

Enter the abbreviation of the agency entering the data.

F. Date.

Enter the date the form is filled out, e.g., **8/14/81**

Line 2

A. Soil Symbol.

Eater the soil symbol of the area at tbe sample site (if known).

B. Soil name.

Enter the name of the soil identified at the sample site or through reference to the soil survey, e.g., NORFOLK **FINE SANDY LOAM,** 3-5 **PERCENT** SLOPE.

C. Soil **ident** at site?

Indicate whether soil is identified at the site by soil scientists. Enter **Y** for yes or N for no.

Line 3

A. Soil interpretations record number.

Enter the number of the soil interpretations record (if known) e.g., VAO026.

B. USDA texture.

Enter the textural symbols including modifier **of** the surface layer, e.g., CR-L. Use only the approved symbols in the National Soils Handbook.

C. Slope percent.

Enter the percent slope to the nearest percent on slopes greater than one percent: enter to the **nearest** 0.1 percent for slopes less than one percent.

D. Flooding.

Enter the flooding frequency that most nearly represented sample site. Use NONE, RARE, OCCAS, *or* **FREQ. Do not use** *COMMON.*

E. **Other** phase criteria.

Enter the critical phase terms on the interpretations record other than surface texture, slope, or flooding that are needed to select the correct capability and yield interpretations for the component, e.g., ERODED, MOD ALKALI, SEV ER. Use the same terms to define the critical phase criteria as are used in the interpretations record. Use appropriate abbreviations listed in the National Soils Handbook.

Line 4

A. Erosion.

Enter one of the following codes that most nearly represent the estimate of erosion:
1 = Slight
2 = Moderate
3 = Severe

B. Color of A horizon.

Enter the color (Munsell notation) of the A horizon.

C. Thickness of A Horizon.

Enter the thickness of the A horizon (inches).

D. Organic matter.

Enter an estimate or measurement of the percent of organic matter (organic carbon x 1.75) in the A horizon.

E. pH.

Enter the pH of the surface 4 inches at time of harvest, e.g., 6.7.

F. Rooting depth (inches).

Measure the depth to fragipans, bedrock, gravel, or other root impeding layer. If greater than 60 inches enter >60.

G. Slope length.

1. Through site (ft).
Enter the length of slope in feet through the sample site. On terraced land enter the distance between terraces. Slope length is the distance from the point of origin of overland flow to either (a) the point where the slope decreases to the extent that deposition begins or (b) the point where runoff enters an area of concentrated flow or channel.

2. Above site (ft).
Enter the length of slope in feet from point of origin of overland flow to the sample point.

H. Slope.

1. Kind.
Enter one of the following codes that most nearly represents hind of slope at the sample site:
1 = Summit
2 = Shoulder
3 = Backslope
4 = Footslope

2. Shape.
Enter one of the following codes that'most nearly represents the slope shape:
1 = Convex
2 = Plane
3 = Concave
4 = Undulating
5 = Complex

I. Aspect.

On slopes where aspect is important enter one *of* the 8 points of the compass that the slope faces, e.g., NE.

J. K factor.

Enter the soil ● rodibility (K) factor.

Line 5

A. Moisture reserve at planting time.

Enter one of the following codes:
1 = Above normal
2 = Normal
3 = Below normal

B. Moisture reserve at beginning of spring growing season following fall planting (winter wheat, rye, etc.).

Enter one of the following codes:
1 = Above normal
2 = Normal
3 = Below normal

C. Precipitation during the growing season.

1. Qualitative.
   Enter one of the following codes that represents qualitative judgment:
   1 = Above normal
   2 = Normal
   3 = Below normal

2. By month.
   If monthly records are available enter to the nearest inch the precipitation for each month.

C. Drought damage.

Enter one of the following codes that represents the judgment of the amount of crop damage caused by drought:
0 = None
1 = Slight
2 = Moderate
3 = severe

D. Water damage.

Enter one of the following codes that represents the judgment of the amount of crop damage caused by excessive wetness:
0 = None
1 = Slight
2 = Moderate
3 = severe

E. R factor.

Enter the R (Rainfall) factor.

Line 6

A. Multiple cropped.

Is the site double or triple cropped? Enter Y for yes, or N for no.

NE580.1-8

B. **Current crop.**

Enter the crop name from the crop list exhibit in the National Soils Handbook.

C. ***Cultivar** (variety).

Enter the name or identification of the crop variety.

D. *Previous crops.

Enter the name of the crop grown in first previous crop season, second previous crop season, third previous crop season.

Line 7

A. *Planting information.

1. Date.
   Enter the date of planting (month/day/year) if known, e.g., 5/15/80.

2. Timing.
   Enter a code that represents the estimate of timeliness of planting:
   1 = Early
   2 = Normal
   3 = Late

3. Seeding rate.
   Enter the pounds per acre that were planted.

4. Row spacing.
   Enter the row spacing in inches.

B. Harvest information.

1. Date.
   Enter the date of harvest (month/day/year), e.g., 9/10/80.

2. Timing.
   Enter a code that represents the estimate of timeliness of harvesting:
   1 = Early
   2 = Normal
   3 = Late

4. Crop Yield.
   Enter the amount of harvested crop per acre, e.g., 110.
   Use standard procedures for measuring yield.

5. Unit of measure.
   Enter the unit of measure for the crop, e.g., bu/ac.

6. Residue yield (T/Ac).
   Enter the air dry tons per acre of crop residue (estimate if necessary).

Line 8

A. *Commercial fertilizer.

   1. N
      Enter the pounds of elemental nitrogen applied per acre

   2. P
      Enter the pounds of elemental P applied per acre.

   3. K
      Enter the pounds of elemental K applied per acre.

   4. Other fertilizer materials (excluding lime)
      a. Specify kind, e.g., ZINC
      b. Enter the pounds per acre applied.

B. *Organic materials.

   1. Enter tons of manure applied per acre.

2. Enter the code representing the kind of manure:
   1 = Cattle
   2 = Poultry
   3 = Hog
   4 = Horse
   5 = Sludge (human)
   6 = Other

C. Crop residues returned.

Enter Y for yes or N for no.

D. **Tillage.**

Enter the code that represents the kind of tillage practice at the sample site:
1 = No till (slot tillage)
2 = Strip till
3 = Other conservation tillage
4 = Non-conservation tillage (moleboard, disk plow, lister)

E. Weed control.

1. *Were herbicides used for this crop?
   Enter Y for yes or N for no.

2. *Enter the number of cultivations used primarily or partly for weed control.

3. Enter a code that represents the extent of weed damage on this crop:
   0 = None
   1 = Slight
   2 = Moderate
   3 = Severe

F. Insect and disease control.

1. Were chemicals used to control insects or disease? Enter Y for yes, N for no.

2. *If chemical control was used enter the code that represents the kind of treatment:
   1 = Foliage
   2 = Seed
   3 = Soil
   4 = Two or more of the above treatments

3. *If foliage treatment, enter the number of applications of chemical insects or disease control.

4. Enter a code that represents the extent of insect or disease damage on this crop:
   0 = None
   1 = Slight
   2 = Moderate
   3 = severe

Line 9

A. Other damage.

Enter a code that represents the extent of damage from other causes such as hail, wind, lodging, freezing, etc.:
0 = None
1 = Slight
2 = Moderate
3 = Severe

B. Conservation practices, other than tillage and cropping sequence.

Enter one of the following conservation practices codes. If more than one used, enter the code listed first:
0 = None
1 = Terraces
2 = Strip cropping, contour
3 = Strip cropping, field
4 = Strip cropping, wind
5 = Contour farming

C. Irrigation.

1. Was irrigation water applied to this crop? Enter Y for yes, or N for no.

2. Issuing type:
   1 = Furrow
   2 = Sprinkler
   3 = Drip
   4 = Flooding

3. If irrigated, enter a code that represents the adequacy of irrgation in meeting crop moisture requirements:
   1 = Good
   2 = Fair
   3 = Poor

D. Drainage.

1. *Is this soil artificially drained? Enter Y for yes, or N for no.

2. Enter a code that represents the damage to the crop caused by excessive wetness:
   0 = None
   1 = Slight
   2 = Moderate
   3 = Severe

E. c factor.

Enter the C factor (cover and management factor used in the Universal Soil Loss Equation) applicable to the site.

• = Information needed from farmer interview. All other information can be collected by USDA employees.

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

SCS-SOI-1
1-81

SOIL-CROP YIELD DATA

KEYING INSTRUCTIONS: DUPLICATE SAMPLE NUMBER ON ALL LINES

1. Sample Number

ST	CO	ID	Kind of Plot	Size of Plot	X Coord.	Y Coord.	Location Description	Agency	Date MO	DY	YR
31	390	2	1	55 Ac	94000E	95500 N	Bill Rolf SE 55 Ac ... Sec 23 T 18N R 4W	SCS	09	15	81

2. Soil Ident

Soil Symbol	Soil Name	Soil Ident. at Site (Y-N)
Be A	Belfore silt loam 1-3% slope Ilel ... eld	N

3. Soil Info

Interp Record Number	USDA Texture	Slope (PCT)	Flooding	Other Phase Criteria
NE0007	SiL	1.0	None	-

4. Other Soil Info

Erosion	A Horizon Color	A Horizon Thickness (IN)	Organic Matter (PCT)	pH	Rooting Depth (IN)	Slope Length Thru Site (FT)	Slope Length Above Site (FT)	Slope Shape	Aspect	K Factor
1	10YR3/2	10	3	6.1	>60	550	-	2	N	0.32

T = 5

T/K = 16

5. Weather

Moisture Reserve at Planting	Moisture Reserve at Start of Grow Seas	Qual	1	2	3	4	5	6	7	8	9	10	11	Drought Damage	Water Damage	N Factor
1	3	3	.2	.3	1.1	2.5	3.0	2.6	3.2	5.0	1.8	0.9	0...	1	0	150

(Precipitation during growing season by month)

6. Crop Data

Multi Cropped N-Y	Current Crop	Current Cultivar (Variety)	First Previous Crop	Second Previous Crop	Third Previous Crop
N	Corn	MC. 6555	Corn	Corn	Soybeans

Erosion T/Ac

7. Crop Data (Cont)

Planting Date MO	DY	YR	Timing	Rate Seeds Ac	Row Spac	Harvest Date MO	DY	YR	Timing	Crop Yield	Unit Meas
05	06	81	2	22000	36	09	15	81	1	115	bu/...

3T/Ac

8. Crop Mgt.

Commercial Fertilizer LB/AC N	P	K	Other Kind	Other LB/AC	Manure T/AC	Manure Kind	Crop Y-N	Tillage	Weed Control Num Cult	Crop Damage	Insect/Disease Control Chem Y-N	Kind Treat	Num Applic	Crop Damage
160	-	-	-	-	-	-	Y	4	2	1	Y	3	1	0

9. Crop Mgt. (Cont)

Other Damage	Cons Pract	Irrigation Y-N	Type	Adequacy	Drainage Y-N	Crop Damage	C Factor	Name
0	0	Y	1	1	N	0	0-31	/s/ Bill Reinsch

A Computer Based Data System by Soil Series
Comments by
M. J. Mausbach

I. Status of Present or Proposed Systems

A. Pedon coding system for the National Cooperative Soil Survey--published July 1979. This system provides standard formats and terminology for encoding morphological, characterization (laboratory), and engineering data. Use of the coding system would provide a nationwide data base of computer compatible records to be shared by all cooperators. As part of this pedon coding system, we have proposed the pedon data subsystem which would house the morphologic, characterization, and engineering data. Programs for the pedon data subsystem have been partially tested. The system is not functional for entry of data by users. Decisions as to the place where the system will be established are left to be made.

1. Morphologic Data--Programs for entering data via the Harris system are being developed at the MNTC. The "write" program for reproducing the data in block format is functional.

2. Laboratory data--Programs for entering the data via Harris have not been developed. (They are developed for entering data into the NSSL format.)

3. Engineering data (SOILS-IO's)--This system was developed at the Washington computer center many years ago but most of the records were inadvertently scratched recently. John Thompson is working on programs for entering and retreiving this data via the Harris system. One method of retreival will be in the table format of the soil survey reports. The system is due to be tested by some states this spring.

B. Soils Data Index--SCS-SOILS-8 Form

The SOILS-8 form was issued about 6 years ago along with specific instructions for completion. The soils data index is to contain a listing of available data by source laboratory, by series and higher categorical levels, and by state and county. It is also a means for obtaining the correlated classification of the pedon.

The soils data index is not functional. It has never been staffed to enter the data onto a computer.

II. Making the System Operational

A. Pedon Data Subsystem

A major factor is deciding where the system is going to be placed and howitwill be financed. The IRIS staff in Washington was established about 2 years ago to help coordinate and expedite these decisions. I would prefer to contract with a data management group at a university. Major problems in making the system operational are:

1. Correct classification of pedons for which data are available.

a. Includes classifying pedons collected during the last 25 to 30 years.

b. Includes a system (procedure) to update the classification of these pedons as series concepts change.

Getting the soils data index functional would also help in establishing the pedon data subsystem.

2. Getting the data in a suitable 'format for entry into the subsystem.

3. Developing procedures for releasing the data to various users such as credits in publications, etc., should these problems arise.

4. Getting contributing laboratories to enter data into the system.

B. Soils Data Index--Again, the major factor is deciding how and where the system will operate and who will be responsible for it. USDA centers are a good choice for USDA cooperators but are not available to everyone. A university operated center funded by cooperators (including SCS) is a possibility. Getting this system operational will be somewhat easier than the pedon data subsystem since the index does not require a commitment of data from the contributing laboratories. In my estimation, the soils data index is the first step to getting the pedon data subsystem functional.

STATE ____________________
M.R.A. ____________________

MARSHALL SERIES Attachment No. 6
(slope)
(erosion)
PEDON 56IA-029-2

Marshall, __________ phase consists of dark-colored, well drained silty soils. They have formed in loess under grass vegetation. They occur on upland ridges and sideslopes and to some extent on benches. Slopes are typically 2 to 14 pct. They are usually moist and have shallow restricted free water in a thin zone due to frost impedance February and March. This pedon is on 3 percent slope, under clover vegetation, and is ______ eroded. The pedon is located ______________________________. It is classified a Typic Hapludoll, fine-silty, mixed, mesic.

	1	2	3	4	5	6	7	8
	DEPTH IN (CM)	HORIZON(S)	TEXTURE CLASS	< 2 CHROMA PCT	WATER STATE	ORGANIZATION: STRUCTURE	ORGANIZATION: PORES	CONSISTENCE
1	0-7 (0-18)	Ap	Silty clay loam	M / S	Very moist	Weak medium subangular	Common root channels	Friable
2	7-13 ([illegible])	A1, A3	Silty clay loam	M / S	Very moist	Weak fine subangular	Common inped tubular	Friable
3	13-32 ([illegible])	B2	Silty clay loam	< 2 M / S	Very moist	Weak fine subangular; prismatic	Common fine inped tubular	Friable
4	32-58 ([illegible])	B3	Silty clay loam	10 M / S	Slightly moist	Weak medium prismatic; coarse	Many fine inped tubular	Friable
5	58-76 ([illegible])	C	Silty clay loam	50 M / S	Very moist	Massive	Many fine inped tubular	Friable
6								

	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	UNIFIED	AASHO	GT 3 IN	PASS SIEVE 4	10	40	200	LL	PI	BULK DENSITY G/CC	PERMEABILITY IN/HR (CM/DAY)	WRD	pH .01M $CaCl_2$	CONDUCTIVITY MMHOS/CM	COLE	SO_4 PPM
			<- - -	- - -	PCT	- - -	- ->									
1	CL	A-6	0	100	100	100	95	40 E	16 E	1.42	1(40)E	.15	5.0 E		.024	
2	CL	A-7	0	100	100	100	98	41 E	26 E	1.27	1(60)E	.16	5.5 E		.032	
3	CL	A-6	0	100	100	100	97	40 E	26 E	1.22	1(60)E	.14	5.5 E		.034	
4	CL	A-6	0	100	100	100	97	38 E	15 E	1.3	.4(24)E	.155	5.7 E	.3	.03	
5	CL	A-6	0	100	100	100	97	38 E	15 E	1.32	[illegible](24)E	.185	5.8 E		.030	
6																

	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	VOL. COARSE FRAG.	2-0.5	0.5-0.25	0.25-0.1	0.1-0.05	0.05-0.002	LT 0.002	15-BAR	ORGN CARB	BULK DENSITY WHOLE G/CC	VOID RATIO WHOLE	COLEI	ENGINEERING WHOLE DENSITY MOIST	SATURATED
		<- - -	- - -	- - -	PCT	- - -	- - -	- - -	- ->				<- - - - G/CC	- - - ->
1	0	tr	tr	tr	2	66	31	14	2.1	'18'	.87	.014	1.77	1.88
2	0	tr	tr	tr	2	64	33	14	1.6	'[illegible]'	1.17	.014	1.55	1.76
3	0	tr	tr	tr	3	66	30	14	0.6	'[illegible]'	.96	.017	1.53	1.76
4	0	tr	tr	tr	4	68	28	13	0.2	'[illegible]'	.9	.01	1.6	1.8
5	0	tr	tr	tr	3	69	28	13	0.1	'[illegible]'	.93	.014	1.64	1.82
6														

	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	EXTRACTABLE CA	MG	NA	K	AL	ACTY	CAT EXCH CAP NH4Ac	SUM	BASE SAT NH4Ac	SUM	SAR	$CaCO_3$ %	GYPSUM %	AVAIL P
	<- - - -	- - -	- - -	MEQ/100G	- - -	- - -	- - -	- ->	<- -PCT	- ->				
1	13.5	4.5	.1	.2		12.6	22	31	85	60				
2	[illegible]4	6.2	.1	.6		9.8	23	31	93	70				
3	14.5	7.6	.1	.6		6.5	23	29	100	80				
4	14.3	7.6	.2	.6		5.0	22	28	105	80				
5	14.6	7.8	.2	.7		4.0	22	27	110	85				
6														

	53	54	55	56	57	58	59
	DEPTH IN (CM)	AMOUNT OF WATER: WS1	WS2	WS3 IN (CM)	WS4	WS5	WS5/ET DAYS
1	0-10 (25)	2.5 ([illegible])	3.2 ([illegible])	2.5 ([illegible])	3.9 (9.9)	'54'	8
2	[illegible]-20 (50)	[illegible] ([illegible])	[illegible] ([illegible])	[illegible] ([illegible])	6.5 (22)	'54'	17
3	[illegible] (100)	[illegible] (15)	[illegible] ([illegible])	[illegible] ([illegible])	17.2 (44)	'54'	32
4	[illegible] (150)	[illegible] ([illegible])	[illegible] ([illegible])	[illegible] ([illegible])	17.7 (65)	'54'	45

Note 1. [illegible] (0-[illegible] in 150 cm) = 9.0

	60	61	62	63
	AGRONOMIC EVALUATION OF [illegible]: TEST	UNITS	HORIZON, DEPTH-IN (CM): Ap	[illegible]
1	K Factor		.37	
2	Calcium	LBS/A([illegible])	[illegible]	[illegible]
3	Magnesium	LBS/A([illegible])	[illegible]	[illegible]
4	Potassium	LBS/A([illegible])	[illegible]	[illegible]
5	Phosphorus	LBS/A([illegible])		
6	Organic Matter	%	[illegible]	[illegible]
7	Cat. Exch. Cap.	MEQ/100G	[illegible]	[illegible]
8	Lime Required	[illegible]		

70

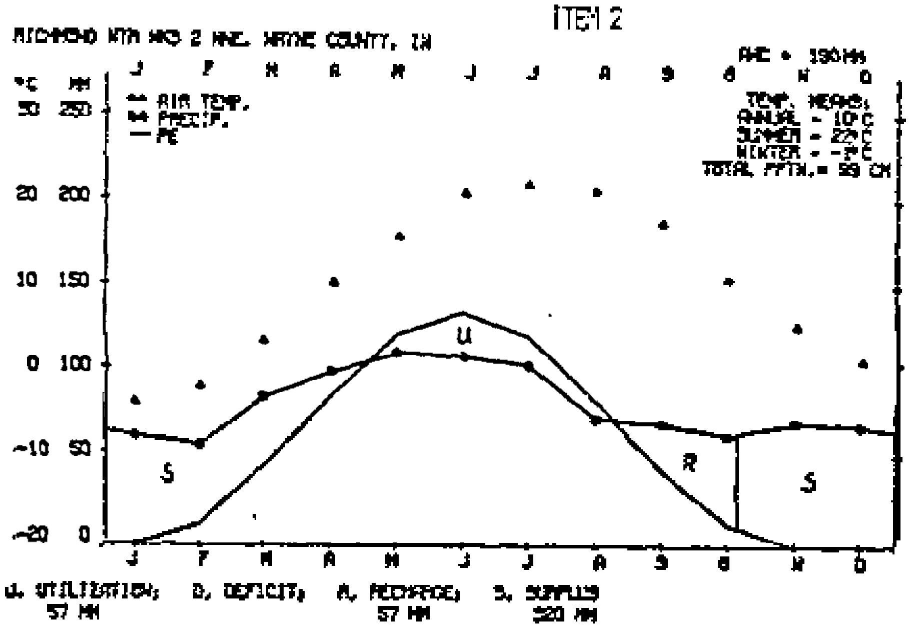
ITEM 2

ITEM 1

Series:

Cresco

No. Records:
1



ITEM 3

	PERCENT PROBABILITY	- - - - CRITERIA FOR MOISTURE CONTROL SECTION (MCS) - - - -		
1	30	DRY SOME/ALL PARTS MCS	90 OR MORE DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
2	0	DRY SOME/ALL PARTS MCS	6/10 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
3	0	DRY ALL PARTS MCS	1/2 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
4	0	DRY ALL PARTS MCS	3/4 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
5	100	MOIST SOME/ALL PARTS MCS	90 OR MORE DAYS CONSECUTIVELY	WHEN SOIL TEMP 8 DEG C OR HIGHER
6	0	DRY ALL PARTS MCS	45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER SUMMER SOLSTICE
7	100	MOIST ALL PARTS MCS	45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER WINTER SOLSTICE

SOIL TEMPERATURE REGIME: MESIC   ESTIMATED FROM NORMAL AIR TEMPERATURES

SOIL MOISTURE REGIME: UDIC   ESTIMATED FROM PROBABILITY VALUES IN LINES 1, 3, 5, 6, 7

AND MOISTURE REQUIREMENT IS "TYPIC" FOR ARGIALBOLLS

ESTIMATED DATES AND DURATION WHEN SOIL TEMPERATURE IS 5 DEG C AND ABOVE. BEGINS APR 11 ENDS NOV 25 DURATION 228 DAYS.

ESTIMATED DATES AND DURATION WHEN SOIL TEMPERATURE IS 8 DEG C AND ABOVE. BEGINS APR 24 ENDS NOV 6 DURATION 196 DAYS.

ITEM 4

A	B	C	D	E	F	G	H	I	J	K	L
Depth	Water Retention						Hydraulic Conductivity		Bulk	Volume	EC
	1	10	33	200	1500	10-1500	Saturated	5kPa	Density	>2mm	
	<----kPa---->										
cm	<----Vol.Pct---->						<----cm/day---->		g/cc	Pct	mmhos/cm
0-27	42	40	35	17	8	32			1.45	0	
27-55	42	41	38	37	26	15	80		1.45	0	
55-75	41	40	31	31	25	15	50		1.50	0	
75-150	24	23		15	9	14	1		1.95	tr	

ITEM 5

	Ref. Nos.
Item 1: Explanation A	
Item 2: Explanation A	
Item 3: Explanation A	
Item 4: Explanation A	1

1. Franzmeier, D. P. Personal communication and reference 1 in Item 9.

ITEM 7

Part	Quantity
A	Rooting Depth, cm Plants: Corn, Soybeans Base Common: 30

[redacted]

10-200 kPa: 9
10-1500 kPa: 12

Part	Quantity
C	Water Movement, cm/day Infiltration Rate: Intake Rate: Surficial Hydraulic Conductivity Saturated: 10 5kPa:

ITEM 6

Annual Use Sequence(s):
Crosby Silt Loam, 0-2%
Corn-Soybeans, Conventional
Typifying Survey(s):
Boone County, IN

ITEM 8

Part A

Average - 6 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	WN	WN	WN	WN	MV	MV	MS	MS	MS	MS	MV	WN
	F	F	F	F								F
25- 50	WA	WA	WA	WN	WN	MV	MS	MS	MS	MS	MV	WA
	F	F	F									
50-100	WA	WA	WA	WA	WA	WN	MV	MS	MS	MV	WN	WA
	F	F										
100-150	WA	WA	WA	WA	WA	WA	WN	MV	MV	WN	WA	WA
150-200												
PND-FLD												

Driest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	WN	WN	MV	MV	MS	MS	D	D	MS	MS	MS	MV
25- 50	WN	WN	MV	MV	MV	MS	MS	MS	MS	MS	MV	MV
50-100	WN	WN	WN	WN	MV	MV	MS	MS	MS	MS	MV	WN
100-150	WA	WA	WA	WA	WN	WN	MV	MS	MS	MS	MV	WN
150-200												
PND-FLD												

Wettest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	WA	WA	WA	WN	WN	MV	MV	MV	MV	MV	MV	MV
25- 50	WA	WA	WA	WA	WN	MV	MV	MV	MV	MV	WN	WA
50-100	WA	WA	WA	WA	WA	WA	WN	MV	MV	WN	WA	WA
100-150	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA	WA
150-200												
PND-FLD												

Part B

		J	F	M	A	M	J	J	A	S	O	N	D
Average	Runoff												
	CN	98	98	98	96	88	88	85	85	85	85	88	96
Driest	Runoff												
	CN	98	98	98	96	88	75	75	75	75	75	88	96
Wettest	Runoff												
	CN	98	98	98	97	97	88	85	85	85	85	88	91

Part C

		J	F	M	A	M	J	J	A	S	O	N	D
Average	Erosion				X	X	X						
	Growth							X	X				
Driest	Erosion												
	Growth												
Wettest	Erosion												
	Growth												

ITEM 9

	Ref. Nos.
Item 7:	
Part A - Explanation A	
Part B - Explanation A	
Part C - Explanation A	1
Item 8:	
Part A - Explanation A	1
Part B - Explanation A	2
Part C - Explanation A	

1. Harlan, P. W. and Franzmeier, D. P. 1974. Soil-Water Regimes in Brookston and Crosby Soils. Soil Sci. Soc. Am. Proc. 38:638
2. CN for corn

ENTRY EXPLANATION

Entries are numbered. Usually an explanation pertains to all entries in a column. If rows differ in a column, the row is indicated by a number preceded by a slash. Estimated values are indicated by a following E or by a reduced number of significant figures from the usual. Method codes are given for a number of determinations (for example 3B2). These are found in Soil Survey Staff, 1972. Column numbers are indicated by closing apostrophes. Column numbers in a column means values same as that column.

Entry No.	Comments
2	Soil Survey Staff, 1951. Except a "/R" added if strong root restriction.
3	Soil Survey Staff, 1951
4	Soil Survey Staff, 1951. M for matrix and S for ped surfaces. Not applicable if color value 3 or less.
5	Terms of current draft of new Soil Survey Manual.
6 - 8	Soil Survey Staff, 1951.
9, 10	Computed from '11'-'17'. Soil Survey Staff, 1971.
11-17	Soil Survey Staff, 1971.
18	Method 4A1h. Engineering dry density.
19	Soil Survey Staff, 1971.
20	Method 4C1. Commonly similar to available water capacity.
21	Method 8C1e. Commonly 0.5 unit below pH measured without addition of $CaCl_2$.
22	Method 8E1a; Soil Survey Staff, 1971. Pertains to Salinity class placement and metal corrosion estimates.
23	Coefficient of Linear Extensibility. Method 4D1; Soil Survey Staff, 1971. Pertains to Shrink-Swell class placement.
24	Methods 6F, 6L. Sum of gypsum and water-soluble sulfate. Pertains to concrete corrosion.
25	Method 3B2.
26-31	Method 3A1. Carbonate clay considered silt. Noncarbonate clay on carbonate-free basis.
32	Method 4B2.
33	Method 6A1a. Multiply by 1.7 for estimate of organic matter.
34	Includes coarse fragments as well as fine-earth fabric: $Dbw = '15' \times (1 - \frac{'25'}{100}) + (\frac{'25'}{100} \times Dpw)$
35	$\frac{Dpw}{Dbw} - 1$
36	COLE estimate between 1/3 or 1/10 bar and 15 bar computed on the assumption that linear change in bulk density down to air-dry moisture.
37	Includes water retained against 1/3 or 1/10 bar: $'34' + '20' + ('32' \times '34' \times (1 - \frac{'25'}{100}))$
38	Includes whole soil and the water when all of the pore space is filled: $'34' + (100 - 100 \times \frac{Db}{Dp})$
39-42	Method 5B1a.
43	Method 6G1.
44	Method 6H.
45	Method 5A1.
46	Method 5A3.
47,48	Method 5C.
49	Sodium Adsorption Ratio. Method 5E.
50	Method 6E. Following C indicates >5 percent absolute clay size.
51	Method 6F.
54	Sum of products of '20' and horizon thickness to depth indicated or root-limiting contact, whichever shallower.
55	Water from field capacity to air dryness. Weighted average of the quantity below multiplied by depth. $'20' + .75 \times '32' \times ('34'(1 - \frac{'25'}{100}))$ Air dryness taken as 1/4 of the 15 bar.
56	Water between 5 percent air-filled porosity (Ps-5) and 15 bar to depth indicated or root-limiting contact, whichever shallower. $95 - (100 \frac{Dbw}{Dpw} - ('32' \times '34' \times (1 - \frac{'25'}{100}))$ Use '20' if $(\frac{Ps-5}{100}) < '20'$
57	Water content from (Ps-5) to air dryness. Same as superjacent except '32' divided by 4 and the root-limiting contact ignored.
58	WRD '20' reduced by 1/4 if permeability within or above 0.2 - 0.06 and reduce 1/2 if < 0.06 in/hr. Terminate at root-limiting horizon.
59	Divide '58' by the average daily evapotranspiration during the month of highest evapotranspiration from Thornthwaite, 1948.
60/1	Nomograph by Wischmeier, et al. 1971.
60/2-60/4	Extractable bases from '39'-'42' expressed on elemental basis using conversion relationship in application notes.
60/6	Multiply '33' by 1.7.
60/7	From '45'
Note 1	Weight '58' by depth: 0-10 in(25 cm), 4; 10 to 20 in(25-50 cm), 3; 20 to 40 in (50-100 cm), 2; and 40 to 60 in(100-150 cm), 1.

SYMBOLS

Dbw bulk density whole soil, inclusive of coarse fragments but not water.

Dpw particle density whole soil, usually taken as 2.65.

REFERENCES

Soil Survey Staff, 1951. Soil Survey Manual. USDA Handbook 18.

Soil Survey Staff, 1971. Guide for Interpreting Engineering Uses of Soils. 1971. USDA, SCS.

Soil Survey Staff, 1972. Soil Survey Investigations Report No. 1. USDA, SCS.

Thornthwaite, 1948. Geographical Rev. 38:55-94.

Wischmeier, et al., 1971. J. Soil Water Cons. 26: 189-193.

Committee 3

Report of the Soil-Water Relations Committee
North Central Regional Technical Work-Planning Conference
May 1982

Only three committee members (including the chairman) were present at the sessions on Tuesday (4 May). Moreo ver, discussion at the sessions was not lively among those who did attend. This fact may be due to a lack of basic data on soil moisture regimes--basic information from which we would like to he able to speak. Additionally. we may have a difficult time interpreting the data that are available.

The steering committee presented us with no formal changes. Our discussions centered on two general topics. First, we discussed the concepts of soil moisture that are presently outlined in Chapter 4 of the new Soil Survey Manual. Second, there was some discussion of the proposed regional project to take the place of NC-109.

With respect to Chapter 4 of the Soil Survey

Do" Franzmeier presented data which indicated that water table depths in a "well-drained" Miami soil do not necessarily differ significantly throughout the year from water table depths In somewhat poorly drained Crosby. Yet recommendations for tile drainage are not necessary for Miami soils. The influence of water-table levels on soil color was also discussed for several drainage sequences. Itisclear that we do not have a complete understanding yet of the influence of soil moisture on soil morphology or soil management.

We finally heard a report from Tom Fenton on the proposed regional project to study soil moisture regimes. The project is intended to relate soil wetness to soil-landscape features and soil interpretations by monitoring moisture conditions and soil properties at benchmark sites throughout the region and by studying the collective data to develop regionally significant information about soil moisture. The project has one last review to hurdle before final approval. If approved, it will take the place of the current NC-109 project.

Our committee did not officially address the question of whether we should continue as a committee. Soil moisture is always going to be with us. and one function of this committee in the future might be to serve as a forum to critique the soil-water classifications to be implemented from Chapter 4 of the Soil Survey Manual.

Respectfully submitted,

Michael L. Thompson

Michael L. Thompson
for D. P. Franzmeier

Attachments: Letter from R.B. Grossman to D.P. Franzmeier. 4-23-82
Soil Survey Water Related Information
Explanation of Soil Survey Water Related Information

ATTACHMENT •

United States Department of Agriculture

Soil Conservation Service

Midwest National Technical Center
Federal Building, ROM 393
100 Centennial Mall North, BOX 82503
Lincoln, NE 68501

FTS 541-5363; Commercial 402-471-5363

April 23, 1982

Dr. D. P. Franzmeier
Agronomy Department
Purdue University
West Lafayette, IN 47907

Dear Don:

I am sending you 20 copies of several items for use of your committee and single copies of a couple of items. I have these somewhat disconnected thoughts about the report. You might give me a call:

1. We need a way to bring together what is known about the water regime of our soil concepts. The target in my view should be the specialist in another discipline, not the layman--that specialist may be a conservationist, an engineer, an agronomist, or an extension person. These specialists would write for the layman from the information sheets. The form suggested would add additional sheets to the present 4-page series documentation; it would build on our present documentation. The format should be standard so non-specialists can find the same data expressed the same way in the same @ace.

2. The front side of the first page pulls together the information we have for the series. The entries are now available nationally.

3. The backside and other pages are for annual use sequences of the series, which are defined on a sheet being sent. The annual use sequence specifies plants and man's use; hence, we can consider rooting depths and physical differences in the surface and near surface due to man. We should not consider plant withdrawal of water and near surface physical properties at the series level. Consider Crosby in the woods compared to Crosby in corn-soybeans across the fence in respect to plant water removal, infiltration rate, occurrence of ice, etc. The two are quite different.

4. Rooting depth generalizations are needed. The particular scheme we employ to use the rooting depth information to calculate available water would differ among people and is not very important. What is important is that the soil survey program in the Midwest provides rooting depth generalizations. We need these rooting depth generalizations in order to move ahead with diverse modelling efforts and to better predict the impact of erosion on productivity.

5. The annual, sequence of water states can be used for three kinds of information: (1) to reduce hard data sets; i.e., the data set for Kyle in the complete report, which you have; (2) to generalize from a couple of years of data, as you did for Crosby; and (3) to put down what is thought to be the water regime from field experience alone in order that the concept can be tested and improved.

6. The annual water states sequence uses state classes (Very Moist, Dry, etc.). These can be converted to ranges in water content using the pedon water information from the first page. we can then calculate heat capacity, thermal conductivity, bulk densities between dessication cracks, etc. Some of these calculations are addressed in the enclosed paper given at Atlanta.

7. The Curve Number has been linked to the annual water state sequence. This may be the most important aspect of the whole report. The Curve Number is central to SCS conservation structure design and is used in major modelling efforts, such as CREAMS (you would know if used in ANSWERS). Presently, our

Explanation of "Soil Survey Water-Related Information"

The record consists of two or more pages. Items 2 and 3 on the first page pertain to the series and item 4 to both series and a phase or phases. The second and/or additional pages pertain to plant-soil use concepts, referred to as annual use sequences. The initial entry under each item is referred to as Entry A. Updates will become B, C, etc.

ITEM 1

The number of records refers to the additional sheets beyond the series sheet as of the date indicated.

ITEM 2

The graph is for a station near the center of occurrence of the soil series. The discussion to follow is from a paper in publication by J. A. Thompson, et al., entitled "Computer Program for Obtaining Diagrams of Climatic Data and Soil and Water Balance."

The diagrams are obtained with a computer and a Calcomp plotter using the Fortran program CLIPLOT (available from the National Soil Survey Laboratory).

These diagrams give a simplified graphic picture of the soil moisture regime of a whole soil. They are based on average monthly values from long-term records for precipitation and temperature. The diagrams include potential evapotranspiration (PE) calculated from air temperature and from the available water capacity (AWC).

[redacted] impervious layer, whichever is shallower. An approximation may be obtained from the AWC for the correlated soil series. Utilization is defined as the PE needed to remove water retained in the soil at a tension of less than 1500 kPa. Deficit is the PE occurring while the soil is at or below 1500 kPa moisture. The calendar date when deficit begins is given.

Recharge begins when precipitation exceeds PE and continues until the available water capacity is filled or PE again exceeds precipitation. Surplus exists when precipitation satisfies available water capacity and continues to exceed PE. The period of surplus can be interpreted as the time when runoff from the soil is most likely, or for pervious soils, through-flow is the greatest.

Equal area projection is used to determine the location of vertical lines separating utilization from deficit in the diagram area UD or recharge from surplus in the diagram area RS. Four conditions are tested: 1, if AWC and RS exceed UD; 2, if AWC and UD exceed RS; 3, if RS and UD exceed AWC; or 4, if none of these conditions exist.

ITEM 3

The table gives the calculated soil moisture regime for the taxonomic moisture control section based on monthly precipitation and PE normals. The climate station is near the center of occurrence of the soil series. The calculation scheme was developed by Franklin Newhall (retired), climatologist, Soil Conservation Service. The table may be obtained at either the Washington Computer Center or at the University of Nebraska, Lincoln. The computer program, MRSG, for this purpose addresses a tape file of climate data with one control card.

The explanation to follow is taken from an unpublished paper by Newhall, "Calculations of Soil Moisture Regimes from the Climatic Record":

[redacted]

The soil moisture control section (MCS): The upper boundary is the lowermost depth that dry (tension >1500 kPa but not air dry) soil will be brought to field capacity by 25 mm of water. The lower boundary is the depth to which the available water capacity of a soil is filled by 75 mm of water moving downward from the surface.

Movement of moisture into the soil: The model assumes that moisture enters the soil from the top and fill each increment of soil to field capacity before entering the next increment. When the wetting front reaches the bottom of the soil moisture profile, excess moisture is assumed to be lost by deep percolation or by runoff.

Movement of moisture out of the soil: Except for excess moisture, removal is only by evapotranspiration. It is assumed that in the early phases of the depletion process, one unit of PE removes one unit of moisture. In later phases, one unit of PE removes less than one unit of moisture; less and less is removed as less and less water remains in the soil moisture profile.

Climatological factors: These are the year-by-year record of monthly total precipitation (MP) and of the normal monthly potential evapotranspiration (PE). Monthly precipitation, MP, is assumed to be distributed within the month according to the following rules: a) one-half of MP, called "HP," (for "heavy precipitation") occurs during the principal storm of that particular month. This moisture is assumed to enter the soil instantaneously at the middle of the month and to be added, without loss, to any moisture already in the soil except when AWC is exceeded. This moisture is dissipated at a rate proportional to the available water in the soil; b) the other half of MP, called "LP," (for "light precipitation") occurs in several light falls and is dissipated at the full rate of PE for this month. None of the light precipitation enters the soil except when LP is greater than potential evapotranspiration and AWC is not exceeded. The amount actually that enters the soil, or, if LP <PE, is lost from the soil, is called net moisture activity (NMA).

The second climatological factor, potential evapotranspiration, PE, is estimated from Thornthwaite's formula. Where available, the published monthly average PE values are used. For other stations, [illegible]

[illegible] increments of the assumed available water capacity of 200 mm. Each of these increments or layers is divided into 200 segments to cover the range from 1500 kPa retention to field capacity. These segments, each 1/200 of [illegible]

[illegible] transpiration are needed to remove moisture as the soil dries and as the drying layer occurs deeper in the soil. This concept is applied in the calculation through the assumption that along any diagonal (referred to as a "slant") of the soil moisture diagram, moisture is assumed to be removed with equal ease. It is assumed that for the first few slants, one unit of potential evapotranspiration removes one segment of moisture and that for subsequent slants progressively more units of potential evapotransporation are needed to remove one unit of moisture until in the driest condition and for the last increments of the diagram as many as five units of PE are needed to remove one unit of moisture.

ITEM 4

Column A

These are the depth limits on the soil property table of the S-5 form with subdivisions within these depths. Depths for analyzed pedons may be adjusted to depths determined by the S-5 form.

Column B

This is the lower water content limit of the wet water state class (Item 8). It is not commonly run in the laboratory. Measurements can be made in the field with tensiometers. We use approximations made by adding to the measured retention at 33 or 10 kPa an amount of water equal to a portion of the calculated air-filled porosity for that tension:

Particle Size[a]	Portion of Air-filled Porosity 33 kPa	10 kPa
Sandy, Coarse-loamy[b]	0.50	0.45
Other	0.40	0.35

The value calculated for the measured 10 kPa retention is used if available.

[a] >2 mm excluded; otherwise family particle size rules apply.
[b] Air-filled porosity must exceed 2%. Within this restriction, add 3 volume percent units of water.

Column B may be useful as an estimate of maximum water holding capacity. The difference between cols. B and F may be used as the maximum water retention energetically available to plants.

Columns C through G

These entries are based on laboratory determinations. Retention at 33 kPa may be available but not at 10 kPa. A rough estimate of the retention at 10 kPa may be obtained by adding one-fourth of the calculated air-filled porosity at 33 kPa to the retention at 33 kPa. Retention at 200 kPa is assumed to separate the water considered readily plant available in an energetic sense from that which is difficultly available. Most of the common field crops adapted to usually moist soils or intergrades thereto do not undergo economically important stress if the tension is below 200 kPa in the major part of the depth of common or many roots. The separation at 200 kPa may have little application for plants adapted to the natural water regime of soils drier than the intergrades to usually moist. Selection of 200 kPa was based on the fact that this is about the lowest tension at which retention measurements can be run on sieved samples thereby reducing the cost.

Columns H and I

Hydraulic Conductivity is recorded for the saturated condition and at 5 kPa tension. Both pertain to vertical inplace orientation. Vertical saturated hydraulic conductivity is the same as the permeability of the S-5 soil property table. The estimates on the S-5 property table are based on guidelines relating morphology and on measurements on cores 8 × 8 mm (O'Neil, 1952. SSSAP 10:312). Macroscopic features (structural planar voids, animal burrows, etc.) commonly determine the saturated hydraulic conductivity. These features usually are widely spaced. Hence, the specimen on which measurements usually are made may not contain representatively the con- [redacted]

Columns J-L

These are standard laboratory determinations. The >2 mm includes up to 25 cm diameter material.

Columns J and K permit conversion changing of volume percent water (Cols. B-G) to weight percentage on a <2 mm [redacted] water.

ITEM 5

This is reference information and explanation for Items 1-4. The positional order of the sequence numbers parallels the positional order of the entries under the Item part.

ITEM 6

Annual Use Sequences: These are January to January segments of the soil-use continuum that because of kind of plants or type of management including tillage practices are expected to have a pattern of water states and/or surface or near-surface water movement differing appreciably from other annual use sequences of the same soil phase. The sequences selected should involve major plants and rotations. Actual sequences would be grouped if no useful purpose would be served by separation. Large physical differences in the tillage-affected zone, as well as water-related properties, would be differentiating criteria. But here the focus is on water.

Typifying Surveys: These are published soil surveys in which the annual use sequence under consideration is well exemplified.

ITEM 7

Part A

Major plants are listed for the annual use sequence in Item 6. It is suggested that index plants be established by Major Land Resource Area and applied to the various annual soil use sequences. Maximum depth of occurrence is assigned for the common and few abundance classes of fine and/or very fine roots. If the plants are annuals, the depths are for near physiological maturity. Depths under irrigation may be given. The classes follow those in "Soil Taxonomy" (Soil Survey Staff, 1975. USDA Handbook 436). For future application, it is suggested we implement the suggestions of Harold Taylor presented in the 1979 report of this committee and reduce the abundance class limits for dicots relative to monocots. To the depth of few roots an increment is added to account for upward water movement to the lowermost roots. This adjustment is only made for soils that are usually very moist or wet below the depth of few roots. The depth increments to follow are determined by properties immediately below the lower boundary of few roots:

Depth Increment (cm)	Soil Properties
30	Coarse-silty (>2 mm excluded) or very fine sand; and very friable or friable.
0	>35% clay, loose, or very firm or stronger
15	Other

81

Part B

These water retention sums use the root depths in Part A and the water retention values of Item 4 with adjustments if necessary in the water retention for the tillage-affected zone as given in Item 9. After adjustment for electrical conductivity (Col. L of Item 4 and Fox, 1957. Soil Sci. 83:449), these water retention sums may be employed as available water capacity estimates. The values for the adjusted base of few roots for 10-1500 kPa may be particularly useful as an estimate of available water capacity.

For depths to the base of common roots, the calculation is straight forward. The calculation is somewhat more complex for the zone from the surface to the adjusted lower limit of few roots. It is assumed that in the zone of few roots, only part of the water retained between 10 and 1500 kPa is utilized. The rationale is that water movement at tensions above 10 kPa is slow and that utilization by plants depends importantly on root extension. Therefore, properties indicative of high soil strength and hence difficulty of root extension, would indicate a reduced utilization of water. Presumedly water in the 10-200 kPa range would move more readily to roots than that in the 200-1500 kPa range. Furthermore, it is assumed that as the proportion of the water held above 1500 kPa increases relative to the water in the 200-1500 kPa range that the average tension of the 200-1500 kPa water rises and movement to roots is slower. Guidelines follow based on these generalizations for the percent of laboratory retention that is included. The soil property statements apply to half or more of the zone in question. The adjustments are only made if the annual use sequence is for annual plants or perennials that are not adapted to soils drier than usually moist. For perennials adapted to soils drier than usually moist, the full 10 to 1500 kPa retention is employed.

Soil Properties	10-200 kPa	200-1500 kPa Ratio of Water Retained: 200-1500/1500 kPa ≥0.5	<0.5
	--------	Pct	--------
Very friable or friable, and <35% clay; or, one of the following: strong granular of any size; strong fine blocky or subangular blocky, or strong very fine prismatic	80	70	50
Not above and >35% clay, or firm or stronger	50	30	10
Other	70	50	30

An attractive alternative is to obtain field-determined plant available water through direct measurement. Water content with depth is determined at or near physiological maturity for years where there has been strong water deficiency during the major part of the growing season following wetting to field capacity or above appreciably below the depth of water extraction. Water desorption measurements are made as deemed useful (commonly at least 1500 kPa retention). The 10 kPa water retention estimate is used as the upper limit. The volume percent differences between 10 kPa and the field-determined minimum values are reported for the depth zones of Item 4. The depth of appreciable water extraction by roots is taken as where the water content exceeds the mean of the 10 and 200 kPa retention estimates from Item 4; or, if desorption data are unavailable or at variance with the field water measurements, it is the depth where over the underlying 50 cm there is little or no change in water content. Place the information on field-determined plant available water in a footnote. Finally, the method may be inappropriate in most years for soils drier than ustic or xeric because wetting below the depth of rooting does not occur. In unusually wet years, however, it may be appropriate.

Part C

Infiltration Rate is the flux passing across the soil surface into the soil. The further restriction is made that the measurement employs a sprinkling infiltrometer. Infiltration decreases with time as the soil wets. Hence, time in the wetting process must be specified and antecedent water content is also useful. Usually values for relatively wet conditions are given.

Intake Rate is a concept used to make recommendations on furrow irrigation (SCS Staff, National Engineering Handbook, section 15). It pertains to the curve on a log-log scale of cumulative infiltration versus time. Values are obtained by furrow irrigation tests.

Hydraulic Conductivity is discussed under Item 4. Surficial hydraulic conductivity pertains to the depth affected by tillage, tree harvest and the like, including compaction.

ITEM 8

Part A

This is an estimate by month of the annual water state sequence. It pertains to the nonirrigated condition unless otherwise indicated. A 3 or 5 class set of water states is provided. The second row is used to indicate a frozen condition. The moisture class selected should describe the wetter 1/2 of the depth interval for one-half or more of the month. The water state classes and symbols follow:

Class Name	Symbol	Tension kPa
Dry	D	>1500
Moist	M	1500-1
Slightly moist	MS	1500-200
Very moist	MV	200-1
Wet	W	<1
Satiated	WA	Free water present
Not satiated	WN	No free water
Frozen	F	

The wet class has been subdivided based on whether free water is present. The water content where free water first appears is referred to as satiation (Miller and Bresler, 1978. SSSAJ 41:1020). This water content is calculated in the same fashion as the values for the wet state (Col. 3, Item 4) except the factors are increased by .05.

Flooding and Ponding (PND-FLD) follow definitions in the National Soils Handbook. Entries are only made for average years. If Ponded, a P is shown. If flooded, a two-letter designation is used. The first letter is the frequency class and the second, the duration class.

The table may be used in several ways: 1) to record field experience gained in soil mapping and its quality control, 2) to abstract and generalize from specific measurement data sets, 3) to record specific data sets, and 4) a combination of 2) and 3). For use 3), it is suggested that the months be deleted from the heading and the specific dates inserted. If feasible and in keeping with the kind of information, make generalizations for average (6 years in 10) conditions and for the 2 years in 10 most dry and most wet.

Part B

Rows have been allotted for monthly runoff class and for Curve Number (CN). It is suggested that more effort be put on Curve Number assignments than on runoff.

Either the runoff classes current in the National Soils Handbook or employ the classes to follow which offer the advantage of being more subject to verification. In either case, complete only for average and wet years.

The concept of runoff here involves the ratio of runoff to the total water received by the soil (rain and melted snow) exclusive of rainstorms that exceed the 10-year, 1-hour intensity for the area (USDC Tech. paper 40 or other publications).

Class	Water Received That Runs Off Pct	Guidelines
Very High (VH)	>80	Mainly steep soils with very low infiltration rates such as wet swelling clays.
High (H)	50-80	Mainly moderately steep soils with low infiltration rates.
Moderate (M)	30-50	Gently sloping soils with moderate infiltration rates, or steeper soils with high infiltration rates.
Slight (S)	10-30	Nearly level or very gently sloping soils, or steep soils with very high infiltration rates.
Very Slight (VS)	<10	Level or nearly level soils, or soils with extremely high infiltration rates.

Curve Numbers are the proportion of the total daily rainfall that occurs as runoff. The concept has been thoroughly developed by Service hydrologists for planning design of mechanical structures (for example, pond size versus watershed area). The concept of land unit is very similar to the annual use sequence (SCS Staff, National Engineering Handbook, section 4). Assignment of Curve Numbers should follow Service guidelines with certain modifications to account for the effects of a frozen condition or shallow depths to free water, as follows:

Assume Hydrologic Group D if water state WA above 50 cm, or if WA above 100 cm and Wet (WA or WN) above 50 cm. Otherwise, use the assigned Hydrologic Group.

For months that 0-25 cm is both Wet and Frozen and adjacent months 0-25 cm is Frozen, the CN is 99. If Frozen, but other conditions are not met, the CN is the higher two values: 96 or the CN based on considerations other than whether frozen or not. Do not consider the frozen state as a factor if the soil lacks cementation due to ice in the upper 25 cm. Provisionally, assign antecedent moisture class II while Frozen to soils with aridic or torric moisture regimes and to soils that are Dry 0-25 cm.

Otherwise, assign based on the antecedent moisture (classes I, II, or III) equated with the monthly water state as follows:

I - Dry 0-25 cm; or Slightly Moist 0-25 cm, and Slightly Moist or dry 25-50 cm

III - Wet 0-25 cm

II - Other

Part C

Indicate the ~~months for the annual use sequence in which the soil water state most critically determines erosion~~ and plant growth. Do for 6 years in 10 only.

ITEM 9

This follows Item 5. It is important that the user be able to evaluate the origin of the information in the sense of whether it rests on certain specific data sets, on generalizations from data sets, or is a generalization from field experience with little or no specific quantitative information.

COMMENT BY CHAIRMAN

In use of the information sheet, these considerations have surfaced:

A. A correction for salts should be considered in the calculation of the root-related water retention differences (Item 7, part B).

B. The adjustment of the lower depth of few roots probably should be dropped (Item 7, part A).

C. The tension for the separation of very moist and slightly moist should be dependent on particle size. For sandy materials, the tension might be lowered to 10 kPa. For coarse-loamy materials with a bulk density <1.60, the separation might be at a water content halfway between the retention at 200 and 10 kPa.

REPORT OF COMMITTEE 4

SOIL POTENTIALS

Committee Members:

James H. Thiele, Chairman
Leon B. Davis, Vice-Chairman
Gary LeMasters
Delbert L. Mokma
H. Raymond Sinclair
E.A. Tomkins
Lawrence A. Tornes
John I. Brubacher
Paul R. Johnson

CHARGES AND RESPONSES:

1. Presentation and discussion of soil potential studies in Indiana and North Dakota.

   Approximately 20 minute presentation by both states on "Soil Potentials for Cropland." Handout by Missouri on "Potential Ratings for Septic Tank Absorption Fields", and by Indiana on "Guide for Estimating Corn Yields for Indiana Soils, and "Guide for Determining PI's for Indiana Soils."

   A concern of the group was "will the potential rating remain the same when prices for crops decrease and production and other costs increase?"

2. Summary of benefits and problems encountered in initiating and completing soil potential studies:

   Benefits:

   a. The most accurate soil suitability rating that can presently be developed for decisionmakers.

   b. Emphasizes feasibility of use.

   c. Makes soil surveys easier to use in resource planning - Indicates degree of suitability rather than degree of limitation.

   d. Have interdisciplinary involvement at the local level.

   e. Identifies the corrective measures needed to overcome soil limitations and the degree to which the measures are feasible and effective.

f. It is a way of providing a "Basic Soil Service" that will increase the use of the soil survey.

g. It is a positive approach to solving problems.

Problems:

a. Extremely time consuming.

b. Difficult to get cost estimates.

c. Many disciplines do not want to get involved for a variety of reasons.

d. The need to maintain a file of documentation when often we do not have adequate documentation.

e. Finding experts to provide and supply basic data and costs.

3. Determination of reliable physical and economic data needed to develop soil potentials. What kind of data is the most limiting at the present time?

   Planning experts are often reluctant to take time to provide data, and often there is little data available. Some felt that finding the economic data was much harder than other data. Often we feel uncomfortable with items used for a data base - in other words, are we using the correct data base?

4. Suggested changes needed in the guidelines for data collection or preparation of soil potentials.

   None suggested.

5. Discussion related to items of concern and recommendations of the committee:

   Items of Concern:

   a. Should the name be changed to "Soil Use Potentials" rather than soil potentials?

   b. Make sure you have a user before you develop soil potentials. Some indicated they are of very little value for specific uses.

c. Some people felt that on-site evaluation for certain uses was much more important than soil potential ratings.

d. We have an insecurity that we are using the right approach to developing soil potentials.

Recommendations of the Committee:

a. Not to put potential ratings in soil survey reports in the immediate future.

b. SCS should direct their efforts to developing potential ratings for uses such as cropland, rangeland, forestland, etc.

c. Make sure we have a need for a potential rating before we even consider developing one.

d. Consider a presentation by a user of soil potential ratings at the next work planning conference.

e. We recommend that the committee be continued.

The conference accepted the report of Committee 4.

James H. Thiele

James H. Thiele
Chairman

ATTACHMENT

POTENTIAL RATINGS FOR SEPTIC TANK ABSORPTION FIELDS

Written by:

Ferris P. Allgood, Ph.D.
Soil Specialist
Soil Conservation Service

Others who participated in establishing ratings of the soils:

Ernest K. Boughton, Farmers Home Administration
Don Day, Boone County Extension Service
Douglas S. Seibel, Soil Conservation Service
Fred Unnewhr, Missouri Division of Health

Paul F. Larson, State Conservationist
Bruce W. Thanpson, State Soil Scientist

April 1982
DRAFT COPY

FOREWORD

This "Potential Rating for Septic Tank Absorption Fields,' is a new approach in rating Missouri soils. The procedure provides a method to numerically compare or rate soils for the specific use. The rating is offered as a guide to determine the most suitable soils available for developing a sanitary sewage disposal system. This publication is to be used in conjunction with detailed soil surveys. About one-third of Missouri has a modern soil survey at the time of this publication.

In order to maintain consistency in evaluating soil units in Missouri, a computer program was used to make the ratings. Therefore, a particular soil property has been assigned only one value in this report. Adjustments of these values can be made to represent local costs or conditions.

The Soil Conservation Service will assist Soil and Water Conservation Districts in making any adjustments needed to fit local conditions. In the appendix of the report is an outline procedure that can be used in making such adjustments or prepare potential ratings of soils for other uses.

I am continually being encouraged by the use of soil surveys in land use decisions in both urban and rural areas of Missouri. We in the Soil Conservation Service appreciate the use and demand for soil survey information and welcome the opportunity to assist in acquiring the maximum use of the Missouri soil survey publications.

Paul F. Larson
State Conservationist

THE POTENTIAL RATING FOR SEPTIC TANK ABSORPTION FIELDS

This "Potential Rating for Septic Tank Absorption Fields" can be used as a guide in areas that have a soil survey. This information is to be used as a guide in determining the soil that has the highest potential for installing a septic tank absorption field. This publication does not substitute for onsite investigations that should be made to verify soil conditions in the selected site.

In general, a septic tank disposal system consists of a subsurface tile distributing effluent to the soil from a distribution box that is connected to the septic tank. The special design needed for its proper function is extremely important.

State and local regulations should be consulted before establishing the septic tank system. Design information is available by representatives of the Missouri Division of Health, Missouri Department of Natural Resources, and the University of Missouri Extension Service.

Considering the properties of the soils is important in selecting sites for septic tank absorption fields. The limitations of the soil must be identified before corrective measures can be applied to overcome the deficiencies. However,' in many locations, where extensive limitations exist, it is often practical to select alternative sanitary disposal systems, such as lagoons.

Potential rating: The potential ratings are given in Table 1 for all soil mapping units in Missouri.

Index: Numerical index values, ranging from 0 to 100, indicate the potential rating of the soil for septic tank absorption fields. This index value indicates the comparative potential of the soil for the specified use. For example, a soil having a potential rating of 100 would have 10 points better potential for developing a septic tank absorption field than a soil having a rating of 90. These potentials are based on the quality of the soil.

Rating class: Rating classes of the soils are based on ranges in the Soil Potential Index.

Rating Class	Range in Soil Potential Index
Very high	95-100
High	85-95
Medium	75-85
Low	65-75
Very low	D-65

TABLE 2

Soil Characteristic 1/	Problem	Treatment	cost	Nevative Values 2/
Fine; very fine	V-slow Slow permeability	Mound	$41.66/inch of additional soil	-5/ft.
Aquic	Wetness	Mound	$41.66/inch of additional soil	-5/ft.
fsi fl	Mod. slow perm.	Lateral	$5/ft.	-5/100 ft.
Common	Flooding	Levee $20/ft.	$7,000	-70
Fluvent	Flood depth	Extensive Levee Additional cost	$2,000	-20
Slope	8-15%	Construction	$100/unit slope	-1/unit slope
Slope	15%+		$200/unit slope	-2/uni slope
Alfisol	Fertility	Fertilizer	$100	-1
Ultisols	Fertility	Residue	$200	-2
		Vegetation	$100	-1
Erosion	Mod. erod.		$100	-1
Chert	Rocks	Construction	$100	-1
Stones	20-40% in pedon		$100	-1
Stones	40%+		$200	. -2

1/ Soil Taxonomy, Agriculture Handbook No. 436, December 1975. (The terms used represent defined ranges of soil characteristics that are used in classifying all soils in the U.S.A. These properties listed are important in determining the potential of the soil for septic tank absorption fields.)

2/ Values are subtracted where installation requirements exceed the installation on a soil with no problems.

Steps in preparing potential ratings:

1. Inform users, determine their needs, and initiate action.
2. Identify the technical specialist who will participate.
3. Hold conferences to review procedures and evaluate adequacy of date.
4. Collect additional data, if needed.
5. Prepare soil potential ratings (use form as illustrated in Figure 1).
6. Review and approve ratings as needed.
7. Prepare ratings in final format.
8. Distribute ratings and train users.

ATTACHMENT

GUIDE FOR ESTIMATING CORN YIELDS
FOR INDIANA SOILS

Assumptions:

Estimated corn yields are based on average high level management that 20% of the top farm operators are now using. Yields listed should equal about 90% of the lo-year average high yields obtained from experimental plots. A yield of 155 bushels of corn per acre is listed as the high yield for the best soils in Indiana.

The following soil characteristics are used to evaluate yield changes from benchmark (index soils):

A. Soil Material

1. Loess or silty soils and loamy sediments vs. till soils (40" loamy sediments; 20 to 40" loamy sed./till; 20" loamy sed. or loess/till; 20 to 40" loess/till, and 40" loess).

2. Mineral soil vs. organic and marl materials, drained condition. (0-50" mineral; 0 to 16" muck/mineral; 16-50" muck/mineral; and 50" muck or 16-50" muck/marl).

3. High vs. Low and very low base saturation (eutric, paleo, ultic inter-grade or dystric; and ultisols, umbric or acid family).

4. Dark vs. light colored soils, organic matter. (alfisols, inter-grades; mollisols; and cumulic mollisols).

5. Calcareous vs. non-calcareous soils (calcareous or marl; non-calcareous).

6. Clay iron bands vs. none in sandy soils. (none; thin at 20-50"; thick at 20-50").

7. Fragipans vs. none in soils. (none; weak pan, glossic or below 40"; strong pan at 18-36").

8. Texture of control section (LS, S 40" thick; SL, loamy skeletal 40" thick, or LS or S at 20-40"/loamy, silty or clayey; 18-35%c; 35-45%c; and 45%c).

9. Thick vs. thin solum soils (60" thick; 40 to 60"/S & Gr, rock, or shale; 20 to 40"/S & Gr, rock or shale; 20"/S & Gr, rock or shale; and 20 to 40" to marl).

10. Bottomland vs. upland soils (S, LS, SL or loamy skeletal).

11. Texture of surface layer, soil type (med. & mod. fine; clayey type, all families; SL, LS type if family is fine loamy or fine silty; and SIL, SICL, or L if family is sandy or coarse loamy).

12. Natural soil wetness (texture, W, MW, SP, P or VP and undrained).

13. Slope groups (A,B,C,D,E, & F).

14. Erosion groups (1, 2, & 3).

Estimated changes in yields are shown as a reduction (-bus. of corn) or a yield increase (+ bus. of corn) from a benchmark (index) soil. Corn yeilds which are the same as the index soil are shown as zero. In evaluating the one selected property, the assumption is made that all other soil properties are constant. (Alford and Miami on A slopes are the commonly used index soils. Miami-110 bu/A corn; Alford-120 bu/A corn).

Estimated Yield Changes for Selected Soil Properties:

A. Soil Material

1. Loamy sediments, silty or loess soils and till. (non-till, muck and peat soils are considered as sediments).

Muck, peat & 40" loamy sed.	20-40" loamy sed/till	20" loamy or sil/till	20-40" loess / till	40" loess
+10	+5	index soil	+10	+15

2. Mineral, organic or marl. (mineral soils include all textures).
A. Drained

Mineral soil	0-16"muck/mineral	16-51" muck/mineral	51"muck or 16-51"muck/marl
index soil	0	-15	-20

51" peat
- 50

B. Undrained
Yields not listed

3. High, low or very low base saturation.

High base	Low base(dystric,paleo or ultic)	v/low base(ultisols,umbric or acid family
index soil	-5	-10

4. Dark, light colored and cumulic dark colored soils

Alfisols or	6"dk. Intergrades or	6-10"dk. Mollisols or	10-24"dk. Cumulic 24"dk.
index soil	+5	+10	+15

5. Calcareous or marl and non-calcareous.

Non-calcareous	Calcareous or marl
index soil	-10

6. Clay iron bands and no bands in sandy soils.

No bands above 50"	thin bands at 20-50"	thick bands at 20-50"
index soil	+5	+10

7. Fragipans or glossic soils and no pans.

No pan	Weak pan, glossic or pan below 40"	Strong pan at 18-36"
index soil	-10	-20

8. Texture of the control section related to family placement

A. Mineral soils

	Yield Changes	
Texture	40" de th	20-40" depth over loamy, silty or clayey
LS, s, or Gr	-60	-30
SL or loamy skeletal	-30	-15
18-35%clay	index soil	index soil
35-45%clay	-15	-15
45%clay	-20	-20

B. Muck & Peat

Underlying	Yield Changes	
Texture	51"de th	16-51"depth
LS, s, or Gr	index soil	-15
All other textures	index soil	index soil
marl	index soil	-20

9. Thickness of soil solum.

	Yield Changes	
Soil thickness	18 to 45%c	SL or loamy skeletal
60"	index soil	index soil
40-60" to S&Gr, rock, shale	-10	-5
20-40" to S&Gr, rock or shale	-30	-15
20" to S&Gr, rock or shale	-60	-30
20 to 40" to marl	-20	-20

10. Bottomland and upland soils.

A. Sandy bottomlands, all soil wetness conditions.

	Uplands	Bottomlands
S, LS, SL or loamy skeletal	index soil	+10

B. Other textures, for poorly drained soils.

	Uplands	Bottoms
Poorly drained, all textures except those in A.	index	-10

11. Texture of surface layer.

Med & Mod. Fine	Clayey (all families)	SL,LS(for loamy & silty families	Med & Mod. fine (for sandy or Cs loamy families
index soil	-5	-5	+5

12. Natural soil wetness by textures and evidence of pan in control section (upper material of contrasting families given).

(1) Somewhat poorly, poorly and very poorly drained considered to be artificially drained.

Texture	W	Yield Changes		
		MW	SP	P or VP
Gr, S, LS	index soil	+10	+20	+40
SL or loamy skeletal		+5	+10	+25
18 to 45%clay		0	+10	+20
fragipans (wk or strong)		0	+5	+10
muck & peat 16" thick				+30

(2) Somewhat poorly drained soils which are not artifically drained are the same as above (1). Poorly or very poorly drained soils that are not artifically drained do not have yields listed.

13. Slope Groups

Slope group	Yield changes
A (0-2%)	0
B (2-6%)	0
C (6-12%)	-10
D (12-18%)	-25
E (18-24%)	-40 or N/A
F (24%+)	-60 or N/A

14. Erosion groups

Family texture or pan	Yield changes by erosion groups 1	2	3
Sandy or cs loamy	index soil	0	-5
Cs.silty, fine loamy or fine silty		-5	-10
Fine (35-45%clay		-5	-15
Fine (45%c) or fragipan		-10	-20

GUIDE FOR DETERMINING PI's FOR INDIANA SOILS

General:

Productivity indexes (PI's) for Indiana soils will be the value of corn and equivalent crops minus (-) the sum of the cost of the cropping system (excluding land costs, taxes and return on investment) and the conservation practices needed for the system amortized over the life of the practice. The' cropping system and practices for a particular soil are based on records of Indiana farm operations and the agriculture capability of the soil. All systems listed are within permissible soil loss determined for each soil.

Background -

A. Yields

Crop yields for each soil are determined by evaluating soil characteristics significant to crop production. (See Guide for estimating corn yields of Indiana soils). Yields are given for corn, soybeans, wheat and meadow based on the agricultural suitability of the soil for a particular crop or system of crops.

Records indicate that most soils which will yield 100 bushels of corn per acre on a sustained basis will yield 35 bushels of soybeans, 40 bushels of wheat and 3.3 tons of meadow per acre. This relationship indicates that soybean yields are 35% of corn yields, wheat 40% of corn yeilds, and meadow 3.3% of corn yields. Wheat yields differ for some soils. Wheat yields for sandy, glacial till, clayey or pan soils are 45% of corn yields. wheat yields for soils underlain by sand and gravel at 20 to 40 inch depth are 50% of corn yields.

B. Cropping Systems

Fifteen (15) cropping systems are used or recommended for Indiana soils. This does not include systems which have double cash crop/ year (i.e. grain-row crop [double crop], plow grain or grain-row [double crop], disk grain. A row-grain-row-grain [RGRG* system where residues are removed and the cover crop left is also excluded).

(1) Cropping Systems

Cont. R	RRGM	RGMMM
RRRGx	RRGMM	RGMMMM
RRGx	RRGMMM	GMMMM
RRRGM	RGH	Cont. M
RRRGMM	RGMM	Cont. F

(2) Costs of Systems

Costs (except land, taxes, and return on investment) are determined for preparing, planting and harvesting the crop grown. Fertilizer costs are based only on costs to basically replace nutrients removed by the crop produced, not fertilizer costs to obtain maximum or optimum yields.

Cropping system costs are based on data from tables and graphs listed in Sec V of the technical guide, Soil Conservation Service, and updated to 1972 costs. -The 1962 figures were updated to 1972 "sing a factor of 1.25. I" addition, nitrogen used for producing the crop grown was included. (Phosphorus, potassium and lime are included in tables listed in Sec V).

Cost estimated for 100 bushels corn/A, 35 bushels soybeans/acre, 40 bushels wheat/acre and 3.3 + hay/acres.

(1) crop	Fixed Cost	Variable cost	Total Cost/Acre
Corn*	21.25 1/ +4.00 2/ x1.25=31.56	13.003'	45.00/acre
Wheat	16.00+4.00x1.25=25.00	10.00	35.00/acre
Meadow(1st yr)	12.00x1.25=15.00+18.00=33.00	3.00	36.00/acre
Meadow(2nd yr)	11.15x1.25=13.95+18.00=31.95	3.00	35.00/acre
Meadow(3rd yr)	11.00x1.25=13.50+18.00=31.50	3.00	35.00/acre
Meadow(4th yr)	same as 3rd yr	3.00	
Meadow,con't (5 yrs +)	10.00x1.25=12.50+18.00=30.50	3.00	
Trees,(30 yrs)	1.50/A mill, 40.00/A harvest, T51-3x/yr; and planting 1/ 48.00/A = 94.00 for 30 yrs or $3.13/yr	-	

1' Fixed cost
2/ Hauling

R (corn)		90.00	135.00	180.00	45.00/yr
G (wheat)	35.00	-			35.00/yr
M (grass-Legume)	36.00	71.00	106.00	141.00	34.00/yr

Cost of various cropping systems/year. (Based on 100 bus. corn/A, 40 bus. wheat/A, and 3.3 T/A grass-legume).

*Exclude cost of practices needed for cropping system; land cost; return on investment and taxes.

Cropping System	Total Cost"	Computation	Cost of System/A/yr
Cont R	45.00	45 1	45.00/yr
RRRGx	170.00	170 4	42.50/yr
RRGx	125.00	125 3	41.66/yr
RRRGM	206.00	206 5	41.20/yr
RRRGMM	241.00	241 6	40.16/yr
RRGM	161.00	161 4	40.75/yr
RRGMM	196.00	196 5	39.20/yr
RRGMMM	'231.00	231 6	38.50/yr
RGM	116.00	116 3	38.66/yr
RGMM	151.00	151 4	37.75/yr
RGMMM	186.00	186 5	37.20/yr
RGMMMM	221.00	221 6	36.83/yr
GMMM	176.00	176 5	35.20/yr
Cont M (5 yrs)	170.00	170 5	34.00/yr
Cont F (30 yrs)	94.00	94 30	3.00/yr

(4) Costs of practices for cropping systems used

The practices that Indiana farm operators typically install or apply to carry on a given cropping system are determined for each soil capability unit. The practice is in line with good conservation.

The following list of practices are shown to express the cost per acre per year. These costs are amortized over the approximate life of the practice at a 6% interest rate.

Practice	Information	Cost of Practice/A	Life of practice	Amortized Cost/Acre
1) Drainage				
Tile 60' space	726'/A, 30¢/ft	217.80	30	15.82*
Tile 80' space	544'/A, 30¢/ft	163.20	30	11.85"
Tile random(SPdrained)	180'/A,30¢/ft	54.00	30	3.92':
Surface drains	25 cu yd/A,40¢/yd	10.00	5	1.36*
water control structure	37.00/A x 1.5=55.50/A for structure			
	water system - structure			
	$37.00/A x 1.5 = 55.00		25	4.34
	tile - 54.00		30	3.92 9.62*
	ditches - 10.00		5	1.36
Land smoothing	2 passes over land 35.00		10	4.76"
2) Erosion control				
a) For rainfall runoff -				
Contouring	(See Sec V, Tech Guide)	2.00	5	0.47"
Strip Cropping	" " " "	4.00	5	0.95
Terracing				
Graded	363'/A, 20¢/ft	65.00	20	5.67
Parallel	363'/A, 55¢/ft	199.00	30	14.46
b) For windbreak -				
trees or shrubs	1/40 A/A, see Minn. 6.50 x 1.25 = windbreak criteria	8.12	20	0.70
strip cropping	see above	--		
minimum tillage	less than conventional	--		

Practice	Information	Practice/A	Practice	Cost/Acre
3) Water management -				
Grassed waterways	25'/A,25¢/ft	6.00	5	1.42"
Diversions	100'/A,40¢/ft	40.00	10	5.44
Levees or dikes	N/A-built from spoil	-		
Water supply development for pasture	well or spring	5.00	20	0.50"

"Basic practices used by Indiana farm operators.
Values will be rounded to nearest dollar.

C. PI's for selected soil conditions -

1. Undrained poorly and very poorly drained soils (PI's given according to three major conditions).

Condition	PI
Mineral 18-35% clay -	15
" 18% clay -	10 mucks & peats - 1
" 35% clay -	5

2. F and G slopes (PI's will be shown according to the 2 conditions unless meadow yields - costs for system and practices are greater than:

Condition	PI
Meadow - 60" depth	- 3
LS, S, or 40"·to S, Gr or bedrock	- 1

D. Summary:

Productivity index (PI) is an index of the productive capacity of a given soil over and above normal inputs needed to prepare land, plant, cultivate or spray, harvest and haul crop and replace the nutrients used by the growing of the crop. Other inputs that maximize yields or returns are related to management and are excluded in the determination of PI's.

PI's can be equated to true cash value of agriculture land by assessors and appraisers.

E Subclass

LCU	Cropping Systems NP	Systems SC	Typical or C	Practices for Typical System	Cost of Typical System	Cost of Typical Practice	Total
I1	Cont R		Cont R		45		45
12	Cont R		Cont R		45		45
13	Cont R		Cont R	windbreak	45	1	46
IIe1	RRGMMM	Cont R	RRRGM	waterway, contour or graded contour	41	2	43
IIe2	RRRGMM		$RRRG_x$	waterway, contour	42	2	44
IIe3	RRGMM		RRG_x		42	2	44
IIe4	RRGMM		RRG_x	FSL type - windbreak, waterway, contour	42	3	45
				other type - waterway, contour	42	2	44
IIe5	RRRGM	Cont R	$RRRG_x$	FSL type - windbreak, waterway, contour	42	3	45
				Other - waterway contour	42	2	44
IIe6	RGM		RRRGM	FSL type - windbreak, waterway, graded contour	41	3	44
				Other - waterway, graded contour	41	2	43
IIe7	RGMM		RRGM	Waterway, graded contour	41	2	43
IIe8	RRGMM		RRRGM	FSL type - windbreak, waterway, contour	41	3	44
				Other - waterway, contour	41	2	43
IIe9	RRRGMM		Cont R	FSL type - windbreak, waterway, contour	45	3	48
				Other - waterway, contour	45	2	47
IIe10	RRRGMM	Cont R	$RRRG_x$	FSL type - windbreak, waterway, contour	42	3	45
				Other - waterway, contour	42	2	44
IIe11	RRRGMM		$RRRG_x$	FSL - windbreak, waterway, contour	42	3	45
				Other - waterway, contour	42	2	44
IIe12	RRGMM		RRG_x	FSL - windbreak, waterway graded contour; tile-random	42	7	49
				Other - waterway, graded contour; tile-random	42	6	48
IIel3	RGM	Cont R	RRG_x	waterway, graded contour tile-random	42	6	48
IIe14	RRRGM		$RRRG_x$	waterway, graded contour or contour	42	2	44
IIIe1	RGMMMM	RRRGMM	RGM	FSL type - windbreak, waterway, contour	39	3	42
				Other - waterway, contour	39	2	41
IIIe2	RGMM	RRG_x	RRGMM	FSL type - windbreak, waterway, contour	39	3	42
				Other - waterway, contour	39	2	41
IIIe3	RGMMM	RRRGM	RGM	FSL type - windbreak, waterway, contour	39	3	42
				Other - waterway, contour	39	2	41

LCLI	Cropping System NP	SC	Typical or c	Practices for Typical System	cost of Typical system	Cost of Typical Practice	Total
IIIe4	RGMMMM	RRGM	RGMM	FSL type - windbreak, waterway, contour	38	3	41
				Other - waterway, contour	38	2	40
IIIe5	RGM	RRG_x	RRGM	FSL type - windbreak, waterway, contour	41	3	44
				Other - waterway, contour	41	2	43
IIIe6	RGMMMM	RRGM	RGMM	waterway, graded contour	38	2	40
IIIe7	GMMMM	RRGMMM	RGMMM	waterway, graded contour	37	2	39
IIIe8	RGMMMM	RRRGMM	RGM	waterway, graded contour	39	2	41
IIIe9	RGMMMM	RRRGMM	RGM	waterway, contour	39	2	41
IIIe10	RRGMMMM	$RRRG_x$	RRRGMM	FSL type - windbreak, waterway, contour	40	3	43
				Other - waterway, contour	40	2	42
IIIe11	RGMMMM	RRGMM	RGMM	waterway, graded contour	38	2	40
IIIe12	RRGM	Cont R	RRG_x	FSL type - windbreak, waterway, contour	42	3	45
				Other - waterway, contour	42	2	44
IIIe13	RRRGMM	Cont R	$RRRG_x$	FSL type - windbreak, waterway, contour	42	3	45
				Other - waterway, contour	42	2	44
IIIe14	RGMMM	RRRGMM	RGM	FSL type - windbreak, waterway, contour	39	3	42
				Other - waterway, contour	39	2	41
IIIe15	RGMM	RRG_x	RRGMM	FSL type - windbreak, waterway, contour	39	3	42
				Other - waterway, contour	39	2	41
IIIe16	RGMM	RRG_x	RRGMM	waterway, graded contour or contour	39	2	41
IVe1	GMMMM	RGMM	GMMMM	waterway, stock water dev.	35	2	37
IVe2	RGMMMM	RGM	RGMMMM	FSL type - windbreak, waterway, contour	37	3	40
				Other - waterway, contour	37	2	39
IVe3	GMMMM	RGMM	RGMMMM	waterway, contour	37	2	39
IVe4	GMMMM	RGMMM	GMMMM	waterway, stock water dev	35	2	37
IVe5	RGMMMM	RRGMMM	RGMMM	FSL type - windbreak, waterway, contour	37	3	40
				Other - waterway, contour	37	2	39
IVe6	GMMMM	RGMM	GMMMM	waterway, stock water dev	35	2	37
IVe7	GMMMM	RGMMMM	GMMMM	waterway, stock water dev	35	2	37
IVe8	GMMMM	RGMMM	GMMMM	waterway, stock water dev	35	2	37
IVe9	GMMMM	RGMM	GMMMM	waterway, stock water dev	35	2	37
IVe10	RGMMM	RRGMM	RGMM	FSL type - windbreak, waterway, contour	38	3	41
				Other - waterway, contour	38	2	40
IVe11	GMMMM	RGMMMM	GMMMM	waterway, stock water dev	35	2	37
IVe12	RGMM	RRRGN	RRGMMM	FSL type - windbreak, waterway, contour	38	3	41
				Other - waterway, contour	38	2	40

LCU	Cropping System NP	SC	Typical or c	Practices for Typical System	Cost of Typical System	Cost of Typical Practice	Total
IVe13	RGMMMM	RGH	RGMMMM	FSL type - windbreak, waterway, contour	37	3	40
				Other - waterway, contour	37	2	39
IVe14	GMMMM	RGMM	RGMMMM	FSL type - windbreak, waterway, contour	37	3	40
				Other - waterway, contour	37	2	39
IVe15	RGMMMM	RGM	RGMMMM	FSL type - windbreak, waterway, contour	37	3	40
				Other - waterway, contour	37	2	39
IVe16	RGMMMM	RRGMMM	RGMMM	waterway, graded contour or contour	37	2	39
VIe1	Cont M	GMMMM	Cont M	waterway, stock water dev.	34	2	36
VIe2			Cont M	waterway, stock water dev.	34	2	36
VIe3			Cont M	FSL type & other, waterway, stock water dev.	34	2	36
VIe4			Cont. M	waterway, stock water dev.	34	2	36
VIIe1	-	-	Cont M	waterway, stock water dev.	34	2	36
VIIe2	-		Cont M	waterway, stock water dev.	34	2	36
VIIe3	-	-	Cont M	FSL type or other - waterway, stock water dev.	34	2	36

W Subclass

LCU	Cropping Systems NP	Typical	Practices for Typical System	Cost of Typical System	Cost of Typical Practice	Total
IIw1		Cont. R	tile - 80'	45	12	57
IIw2			FSL type - windbreak, tile-random	45	5	50
			Other - tile - random	45	4	49
IIw3		A slope-Cont R	A-surface drains, land smoothing	45	6	5 1
		B slope-RRRGM	B-waterwayd, graded contour	41	2	43
IIw4		Cont R	FSL type - windbreak, water control system	45	11	56
			Other - water control system	45	10	55
IIws		Cont. R	surface drains,land smoothing	45	6	51
IIw6		A slope-Cont R	A-FSL type-windbreak; tile-random	45	5	50
			A-other - tile-random	45	4	49
		B slope RRRGM	B-FSL type- windbreak, water-way, tile-random; graded contour	41	6	47
			B-other-waterway,tile-random, graded contour	41	5	46
IIw7		Cont R	tile-random; surface drains	45	5	50
IIw8		Cont R	tile - random	45	4	49
IIw9		Cont R	FSL type - windbreak, surface drains	4 5	2	47
			Other - surface drains	45	1	46
IIw10		Cont R	Windbreak, water control system	45	11	56
IIw11		Cont R	FSL type - windbreak, tile-random	45	5	50
			Other - tile-random	45	4	49
IIw12		Cont R	tile - 60'	45	16	61
IIIw1		Cont R	FSL type - windbreak, water control system	45	11	56
			Other - water control system	45	10	55
IIIw2		Cont R	surface drains,land smoothing	45	6	51
IIIw3			A-FSL windbreak, tile-random	45	5	50
			B-FSL windbreak, tile-random, waterway, graded contour	45	7	52
IIIw4		A slope-Cont R	A other-tile-random	45	4	49
		B slope RRRG	B other-tile-random; graded contour; waterway	41	5	46
IIIw5		Cont^{x}R	FSL type - windbreak; surface drain; land smoothing	45	7	52
			Other - surface drain; land smoothing	45	6	51
IIIw6		A slope-Cont R	h-surface drains; land smoothing	45	6	51
		B slope-RRRGM	B-waterway, graded contour	41	2	43

LCLI	Cropping Systems NP	Typical	Practices for Typical System	Cost of Typical System	Cost of Typical Practice	Total
IIIw7	-	Cont. R	surface drains;	45	1	46
IIIw8	-	Cont R	windbreak; water control system	45	11	56
IIw9	-	Cont R	tile - 60'	45	12	57
IIw10	-	Cont R	water control system	45	10	55
IIIw11						
IIwl2	-	Cont R	pans-surface drains, land smoothing	45	6	51
			(35-45%c-tile-60'?)	45	16	61
IVw1	-	Cont R	FSL type - windbreak, water control system	45	11	56
			Other - water control system	45	10	55
IVw3	-	Cont R	mucks - windbreak, water control system	45	11	56
IVw4	-	Cont R	FSL-windbreak, water control system	45	11	56
			Other - water control system	45	10	55

S Subgroup

LCU	Cropping System Typical	Practices for Typical system	Cost of Typical System	Cost of Typical Practice	Total
IIs1	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIs2	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIs3	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIs4	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIs5	-				
IIs6	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIs7	Cont R	FSL type - windbreak	45	1	46
		Other - none	45		45
IIIs1	A slope-Cont R	A-FSL-windbreak	45	1	46
	B slope-Cont R	B-FSL-windbreak, contour	45	1	46
IIIs2	Cont R	FSL - windbreak	45	1	46
IVs1	A slope-Cont R	A-FSL-windbreak	45	1	46
	B slope-Cont R	B-FSL-windbreak, contour	45	1	46
IVs2	A slope-Cont R	A-FSL-windbreak	45	1	46
	B slope-Cont R	B-FSL-windbreak, contour	45	1	46
VIs1	Cont M	waterway, stock water dev	34	2	36
VIIs1	Cont M	waterway, stock water dev	34	2	36

Guides for Soil Information Shown as Agriculture Limitations

		Agriculture Limitations Terminology	Abbreviation
1.	Surfaces		
	SL, LS, & FS	wind erosion	w. eros.
	SIC, & c	clay surface	c. sur.
2.	Slopes	Drainageways:	
	B	sheet erosion	s.eros, d/way
	B slopes for sandy soils	sheet erosion	s. eros.
	all C,D,&E	sheet and gully erosion, sidehill drainageways	S&G eros, d/way
	all F&G	sheet and gully erosion, sidehill drainageways, use of equipment limited	S&G eros, d/way, equip. L.
3.	Erosion	3 erosion (severe)	
	LS,S	no comment	
	SL to 35% c surface; subsoil 35% c	tilth	
	SL to 35% c surface; subsoil 35% c	tilth, c. sur.	
4.	Gravelly, sandy (SL & LS), 40" to S, Gr or bedrock available water capacity limited		AWC
5.	Wetness		
	w or mw drained (no wetness limitation)		
	sp drained (seasonal saturated)		seas. sat
	p drained (seasonal saturated, ponds, water)		seas. sat; ponds
6.	Bottomlands		
	Flooding and deposition		Fld; dep
7.	Fragipao soils		
	w or mw drained (seasonal seepy, avail. water cap., pan)	-	seas. seepy; AWC;pan
	sp drained (seas.sat; seas.seepy; AWC & pan)	-	seas. sat; seas. seepy; AWC; pan
8.	Fertility		
	Low fertility		
	mucks		Fert.
	sands, & 20" to s , gr, or bedrock	-	Fert.
	Utisols		Fert.

9. Other
Mucks, subsides when drained, - sub; w. eros.
subject to wind erosion

Use of criteria:

Soil	Agriculture Limitations
Plainfield LS - C-Z	AWC, s,g&w eros; d/way, fert.
Cincinnati SIL - F-2	s&g eros; d/way; AWC; sea. seepy; pan; equip. limitations
Miami L - B-3	severe erosion; tilth
Brookston SICL - A-O	seas. sat; ponds
Maumee LS - A-O	seas. sat; ponds; fert.; w.eros.
Markland SIC - C-3	sev eros; d/way; tilth; c. sur.

GUIDES FOR YIELD CONVERSIONS TO VALUE OF SYSTEM/YR

Corn (yield x $1.00/bu)				Wheat (yield x $1.25/bu)		Meadow (yield x $22.00 per T)				
Yield	1 Year	2 Years	3 Years	Yield[1/]	1 Year	Yield	1 Year	2 Years	3 Years	4 Years
155	155	310	465	60 70 78	75 88 98	5.1	112	224	336	448
150	150	300	450	60 68 75	75 85 94	5.0	110	220	330	440
145	145	290	435	58 65 73	72 81 91	4.8	106	212	318	424
140	140	280	420	56 63 70	70 79 88	4.6	101	202	303	404
135	135	270	405	54 61 68	68 76 85	4.4	97	194	291	388
130	130	260	390	52 58 65	65 72 81	4.3	95	190	285	380
125	125	250	375	50 56 62	62 70 78	4.1	90	180	270	360
120	120	240	360	48 54 60	60 68 75	4.0	88	176	264	352
115	115	230	345	46 52 58	58 65 72	3.8	84	168	252	336
110	110	220	330	44 50 55	55 62 69	3.6	79	158	237	316
105	105	210	315	42 47 52	52 59 65	3.4	75	150	225	300
100	100	200	300	40 45 50	50 56 62	3.3	73	146	219	292

Corn (yield x $1.00/bu)				Wheat (yield x $1.25/bu)		Meadow (yield x $22.00 per T)				
Yield	1 Year	2 Years	3 Years	Yield[1/]	1 Year	Yield	1 Year	2 Years	3 Years	4 Years
95	95	190	285	38	48	3.1	68	136	204	272
				43	53					
				48	60					
90	90	180	270	36	45	3.0	66	132	198	264
				40	50					
				45	56					
85	85	170	255	34	42	2.8	62	124	186	248
				38	48					
				42	52					
80	80	160	240	32	40	2.6	57	114	171	228
				36	45					
				40	50					
75	75	150	225	30	38	2.5	55	110	165	220
				34	42					
				38	48					
70	70	140	210	28	35	2.3	51	102	153	204
				32	40					
				35	44					
65	65	130	195	26	32	2.1	46	92	138	184
				29	36					
				32	40					
60	60	120	180	24	30	2.0	44	88	132	176
				27	34					
				30	38					
55	55	110	165	22	28	1.8	40	80	120	160
				25	31					
				28	35					
50	50	100	150	20	25	1.6	35	70	105	140
				22	28					
				25	31					
45	45	90	135	18	22	1.5	33	66	99	132
				20	25					
				22	28					
40	40	80	120	16	20	1.3	29	58	87	116
				18	22					
				20	25					

	Corn (yield x $1.00/bu)			Wheat (yield x $1.25/bu)		Meadow (yield x $22.00 per T)				
Yield	1 Year	2 Years	3 Years	Yield[1/]	1 Year	Yield	1 Year	2 Years	3 Years	4 Years
35	35	70	105	14	18	1.2	26	52	78	104
				lb	20					
				18	22					
30	30	60	90	12	15	1.0	22	44	66	88
				14	18					
				15	19					
25	25	50	75	10	12	0.8	18	36	54	72
				11	14					
				13	lb					
20	20	40	60	8	10	0.7	15	30	45	60
				9	11					
				10	12					
15				6	8	0.5	11	22	33	44
				7	9					
				8	10					
10				4	5	0.3	7	14	21	28
				4	5					
5				52	62	0.2	4	8	12	lb
				2	2					
				2	2					
0				0		0				

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NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
OF THE NATIONAL COOPERATIVE SOIL SURVEY

MAY 4-6, 1982
FARGO, NORTH DAKOTA

Committee 5: Educational Activities for Soil Resources and Land Use.

CHARGES:

1. Develop an exchange network among those individuals responsible for teaching field soil survey techniques in the North Central Region prior to the 1982 NCRWPC meeting. Laboratory source materials for teaching soil interpretations should be part of the exchange program.

2. Provide leadership in the development of correspondence courses in soil taxonomy and soil interpretation. Submit letters to Agronomy Journal and other appropriate newsletters and journals describing the committee's efforts in developing correspondence courses.

3. Continue support of the correspondence course offered by SCS on "Soil - Soil Surveys and Their Uses". Assist, if requested, in course review and revision.

4. Approach personnel of the North Central Region Educational Materials Project at Iowa State University and the Information Division of the SCS with respect to the development and financing of TV spots designed to create public awareness of soil surveys and their use.

FINDINGS:

Charge 1. Develop an exchange network, including laboratory source materials, for teaching field soil survey techniques and soil interpretations in the North Central Region.

a. Agreed that as field mapping continues toward completion in the various states in the North Central Region, there will be an increasing demand for persons trained in soil interpretations.

b. Agreed that participants in the Committee on Educational Activities for soil resources and land use are encouraged to bring recent educational materials to subsequent meetings for exchange with colleagues.

c. Agreed that pertinent materials developed in the interim between NCR work planning conferences will be shared among appropriate colleagues and members of the committee from each state.

d. Agreed to develop a compendium of abstracts or tables of contents of teaching materials in pedology, field soil survey techniques and soil interpretations used in the North Central Region for distribution among individuals with teaching responsibilities in those areas.

Charge 2. Provide leadership in the development of correspondence courses in soil taxonomy and soil interpretation.

a. A letter describing the committee's interest in developing correspondence courses in soil taxonomy and soil interpretations and soliciting responses from persons and institutions interested in developing and implementing these courses was submitted to Agronomy News, the Journal of the National Association of College Teachers in Agriculture, and the Journal of Agronomic Education.

b. Several requests for additional information about the courses were received from interested individuals, indicating that there is interest in correspondence courses in these areas.

c. Determined that the Continuing Education Division at Kansas State University, which had expressed an interest in providing institutional support for developing and implementing such correspondence courses, would require funding in excess of six thousand dollars ($60001 to support development and implementation.

d. Determined that the Department of Agronomy at Cornell University is offering an "individually arranged" course on Use of Soil Information and Maps as Resource Inventories to individuals in New York state. A description of that extramural course is described in Appendix 1 of the committee report. The contact person is Dr. G. W. Olson, Department Of Agronomy, 153 Emerson Hall, Cornell University, Ithaca, NY 14853 (607/256-2177).

e. Agreed that in view of the apparent difficulties in obtaining financial support and the possible duplication with the course described in Charge 3, that the committee should discontinue pursuit of Charge 2 until the disposition of the USDA course in Charge 3 is ascertained.

Charge 3. Continue support of the SCS correspondence course on "Soil - Soil Surveys and Their Uses". Assist, if requested, in course review end revision.

a. The status of this course is uncertain. There are reports that the course may have been placed under the jurisdiction of the USDA graduate school. Status of the course will be clarified by the committee.

b. Agreed to determine the availability of the course to individuals outside the USDA end to ascertain whether academic credit is obtained for individuals who successfully complete the course. If not, it was agreed that efforts should be made to explore means of awarding such credit through an accredited institution.

c. Agreed that the committee should continue to offer to assist and cooperate in revision and review of the course materials.

Charge 4. Approach personnel of the North Central Region Educational Materials Project end the Information Division of SCS with respect to the development of TV spots on soil surveys and their uses.

a. Determined that several states have developed means of providing TV coverage of soil survey and soils related activities on commercial stations through regularly scheduled one to five minute spots. This coverage is usually organized through the Cooperative Extension Service or through independent stations.

b. Learned that the NCR Educational Materials Project has developed a film and video tape collection. Each state in the North Central Region can submit video materials for review. If the material is approved, an NCR publication number can be assigned and the material made available to users of the collection.

c. Wisconsin is developing a 24 minute 16 mm film on on-site waste disposal. The film includes general material on soil surveys and soil interpretations for on-site waste disposal systems.

d. Agreed that each state will compile a list of films, video tapes, end slide sets that contain information pertaining to soils, soil surveys end soil interpretations. A list of visual materials, and their availability, is included in Appendix 2 of the committee report.

Recommendations:

1. That Committee 5, "Educational Activities for Soil Resources and Land Use", be continued as a committee of the 1984 North Central Regional Technical Work Planning Conference of the National Cooperative Soil survey.

2. That the committee be charged with the following activities and responsibilities.

   a. Maintain an exchange network among those responsible for teaching pedology, field soil survey techniques and soil interpretations to share source and reference materials used in teaching, extension and other educational programs.

   b. Continue support of the SCS correspondence course on "Soil - Soil Surveys and Their Uses". Assist, if requested, in course review and revision.

   c. Evaluate the utility of the current format of published soil surveys for soil survey users and programs.

Submitted by:

R.A. Pope
Committee Chairman

Committee Members:

O.W. Bidwell	*G.D. Lemme
● L.E. Brown	*A.S. Messenger, Vice-chairman
C.J. Johannsen	● G.A. Miller
*G.B. Lee	*R.A. Pope, Chairman
	G.A. Steinhordt

* In attendance at the NCRWPC, Fargo.

Other contributing to the committee session were:

J. Anderson	M. Harpstead
L.B. Davis	M. Mausboch
J. Gerken	J. Thiele

Appendix I. to Committee 5 Report

New York State College of Agriculture and Life Sciences
a Statutory College of the State University
Cornell University

Department of Agronomy
Bradfield and Emerson Halls, Ithaca, N Y. 14853
Telephone 607-256-5459

COURSE FOR COOPERATIVE EXTENSION AGENTS, SCS CONSERVATIONISTS, PLANNERS, ENGINEERS, ASSESSORS, ENVIRONMENTALISTS, AND MANY OTHERS.

ANNOUNCEMENT OF INDIVIDUALLY-ARRANGED COURSE ON SOIL SURVEY INTERPRETATIONS FROM CORNELL UNIVERSITY

Agronomy 450 (Special Topics in Soil Science) on USE OF SOIL INFORMATION AND MAPS AS RESOURCE INVENTORIES will be taught to individuals in New York State as an "individually-arranged" course during the regular semester periods September-December and January-May. The course is being taught to provide additional soil survey information to people in many areas who are increasingly using soil surveys for environmental improvement. The course will carry 2 semester hours graduate credit from Cornell University; no prerequisite courses are required for registration. No attendance at regular classes is required, and only about 4 trips to Ithaca will be needed at times mutually convenient to the student and professor. About 100 hours total time will be required. The outline of procedures for taking the course follows:

PROCEDURES

1. Contact Dr. Gerald W. Olson (Phone 607/256-2177) Department of Agronomy, 153 Emerson Hall, Cornell University, Ithaca NY 14853 about your interest in the course and the subject matter.

2. Register as an Extramural Student for Agronomy 450 under Dr. G. W. Olson at Cornell during the regular registration period for the semester in which you wish to take the course.

3. Obtain course materials and assistance from Dr. G. W. Olson through the semester. About 4 trips to Ithaca will be required (at mutually convenient times to be arranged) for 2 exams and consultations. About half the course (50 hours) involves work on a project cooperatively with people at local planning and SCS offices.

4. At the end of the semester, a project report will be submitted to Dr. G. W. Olson and a final exam will be taken. The project report of the student, after evaluation, will be deposited in the local planning office (or other appropriate office) for use by the people of the local community. Description of the course follows on the back of this page.

Agronomy 450 "Special Topics" on USE OF SOIL INFORMATION AND MAPS AS RESOURCE INVENTORIES. "Individually-arranged" during semester. Credit 2 hours. Open to anyone Interested in using soil information. Dr. G. W. Olson.

Principles, practices, and research techniques in interpreting soil information and maps for planning, developing, and using areas of land. Methods of describing soil properties, and using soil descriptions to help solve practical problems of land use and environmental improvement. Principles of soil classification for interpretations. Capability, suitability, and limitation groupings of soils. Interdisciplinary comparisons and correlations of soil maps. Alternative uses of soils in the rural-suburban-urban transition areas. Procuring soil information and using it in development projects. Work on a" actual soils consultant situation. Practice in assembling, presenting, and writing interpretive soils information. A considerable part of the course (about 50 hours) will involve work on a project on soil survey interpretation in cooperation with local professionals. About 100 hours total time will be required for the course.

OUTLINE OF AGRONOMY 450 - "SPECIAL TOPICS"

I. Introduction to Soil Information and its Use - Introduction to course (format, references, project, report, exams, cooperation). Scope of soil survey interpretations. Description of soils in a limited plane (the soil profile description, classification of soils). How to make a soil profile description. Quiz. Landscape of a soil (description, map unit). Kinds of soil maps available. Scales and legends of soil maps.

II. Grouping Soils for Practical Purposes - Exam. Methods of grouping soils. Land classifications. Conservation needs inventory. Soil and water conservation plans. Limitation groupings of soils. Relating data to soil maps (analyses of soils, land use and structure performance). Soil inventories for regional improvement. Recent developments in land classification and land use studies by the Food and Agriculture Organization of the United Nations and other agencies. Computer modeling of watersheds and soil regions for specific management objectives.

III. Uses of Soils - Project in soil survey interpretations. Experience of people using soils information. Special soil surveys for big projects. Past relationships of environment (including soils) and man. Soil survey interpretation in several different specific environments. Using soils for waste disposal. Review of soil survey interpretations and interdisciplinary work in other areas. Opportunities in USA and abroad for soil survey interpretations. Oral project report. Written report submission and evaluation. summary. Final exam.

GWO/ss
10/16/79

Appendix II. to Committee 5 Report

Video-Tape Cassettes and Films Available Through
the Iowa State University Film Library

VIDEO-CASSETTES

Order Number 3/4" U-matic	1/2" Sanyo	Title
73098	74098	Extension Reports: Fishable, Swimmable Waters. 1980. 28:10 minutes.
73232	74232	An alternative Wastewater Disposal System. 1979. 6:10 minutes.
73243	34243	Iowa Agriculture and Water Quality. 1980. lo:oo minutes.

Rental fee is $6.50 per title for out-of-state users.

FILMS

Order Number	Title
S-57506	Iowa's Precious Water. 1978. 29 minutes. Rental price: $16.95.
S-48422	We Are of the Soil. 1977. 23 minute. Rental price: $7.15.

Order VT cassettes and films from: Media Resources Center
112 Pearson Hall
Iowa state university
Ames, Iowa 50011
515/294-1540

North-Central Regional Work Planning Conference
of the
National Cooperative Soil Survey

May 3-7, 1982
Fargo, North Dakota

Conference Report

Committee 6--Soil Correlation and Classification
(Including Forest Soil Classification)

Committee 6 consisted of 17 members. Eight members were present at this conference. Seven members responded by letter to the charges of this committee. A list of committee 6 members is attached.

For this report, committee charges are followed by comments and recommendeations received and reviewed by mail and at the conference.

Committee 6 charges are listed below:

1. List and discuss major soil correlation problems which exist in your state.

a. Note any problems related to the correlation of mapping units which include similar soils.

Summary and Recommendations: There was little comment generated by this question. Apparently, there was neither an interest in nor a problem with inclusions of similar soils in mapping units.

b. Evaluate the 10 percent yield difference criteria often used to justify separation of "similar" map units. Consider the economic implications of a 10 percent yield difference with respect to capitalization of net returns and land values. Are management requirements which may increase production costs but not increase yield justification for the separation of two "similar" msp units?

Summary and Recommendations: In general, the respondents agreed that a 10 percent difference in yield was an important way to justify the separation of two similar units in a soil survey. At the same time, they hastened to add that differences in management requirements which might increase production costs rather than yields could also be justification. Several noted the difference in capitalization that could result from a 10 percent difference in yields. I include one by Dr. Fenton. (Attachment No. 1)

J. Wiley Scott noted that the seed corn companies use a 10 bu/acre yield difference before they consider it a significant difference between varieties in their field tests.

Other notes indicated that we need more exact definitions for the yield figures in order to make them more meaningful. Some examples follow:

The specific moisture content should be stated for some crops such as corn. Whether the yield reported is based an planted or harvested acres. In wet soils or flooded soils, these yields could be significantly different. Another problem with yield figures is with the assumed increase in management intensity as slope increases or with eroded phases. In many states, it is assumed that as slope increased or erosion becomes more severe, the calibur of management increases. This assumption tends to result in smaller differences in yields than otherwise might be true. For example, one correspondent cited a reference that indicated about a 16 bu/acre difference in corn yield between 1 and 2 erosion; yet on yield tables for similar soils in a recent soil survey report from the same state, about 3 bu difference in yield is given. Furthermore, little is said in the soil survey report about increases in management inputs needed on the eroded map units to achieve these yields. This doesn't indicate to the user much significance in the loss of enough surface soil to change from class 1 to class 2 erosion on those soils.

C. Soil correlation problems noted by correspondents. There has been some concern expressed relative to how consistent taxadjuncts have been used in correlation.

Taxadjuncts are polypedons that have properties outside the range of all recognized series. They differ from a recognized series in so few properties and to so small a degree that major interpretations are not affected. Its interpretations are similar to those for comparable phases of the series for which it is named.

To a purist, a taxonomic unit either fits within the range in all aspects of the series for which it is named or it is a taxadjunct. However, careful study of many typical pedons selected to characterize the soils in a particular soil survey will show that they are outside the range for the series as given on the blue copy of the standard series description. Under this option, either the range of the series must be expanded or the soil called a taxadjunct. In many cases, the state responsible for the series doesn't want to expand the range to accommodate the slight departure. At the same time, the property is not deemed important and there is a reluctance to identify a large number of the taxonomic units in the soil survey as taxadjuncts. Thus, small departures from the range of the series in soil reaction, solum thickness, color, texture, etc., that don't clearly place the taxonomic unit in (1) a different established series or (2) in a different taxonomic class are often not called taxadjuncts but are noted in the correlation notes for the survey area. This procedure is commonly used at the MNTC.

During discussion at the conference some participants favored expanding the range of the series while others favored the procedure outlined above. If ranges are expanded for minor items in order too accomodate the end member of a frequency distribution curve, it is often difficult to identify the central concept of a taxonomic unit. Obviously, when the definition of the taxonomic unit (soil series) is updated the correlation notes, mentioned in the previous paragraph, should be studied to determine if the range in characteristics of the taxonomic unit need adjustment.

2. List and discuss deficiencies in "Soil Taxonomy" which affect the classification of soil series and the effect of an inadequate classification framework on soil interpretation.

The chairman has listed three topics for discussion.

a. The chemical criteria by which to validate the tentative field identification of spodic horizons has not been completely satisfactory. The NSSL has been addressing this problem during the last several years. They have developed an alternative chemical definition and a field kit to test the proposed definition. The kits were sent to Minnesota, Michigan, and Wisconsin for use in testing the proposed criteria. Neil Stroesenreuther obtained the information on testing the field kit from these three states.

Identifying spodic horizons has been particularly vexing in the north-central region because we have no good criteria for recognition of the minimal degree of development necessary to constitute a spodic horizon.

"Soil Taxonomy" allows identification of spodic horizons with certain combinations of color plus either continuous cementation as in an ortstein horizon if it is at least an inch thick, or by cracked coatings on mineral grains or silt sized pellets that *have* broken off the mineral grains. These supposedly can be recognized by a hand lens or a microscope in the field so are considered field criteria.

The soils in the north-central region, by and large, seem to lack cracked coatings or silt sized pellets so we must use the chemical criteria to verify our tentative identification of spodic horizons. These tests must be run in a laboratory and are not a part of the field operation. Unfortunately, identification by the chemical criteria doesn't always correlate well with the morphology of soils some people "think" should be Spodosols. This is particularly true of soils with a clay content over a few percent as this influences the pyrophosphate extractable Fe + Al to clay ratio which is one of the chemical criteria required for a spodic horizon.

The procedure developed by NSSL doesn't have to be run in a lab. A compact field kit is available. It uses a humic acid color or aluminum for the determination.

Summary and Recommendations: One group of 19 samples was taken in Michigan and tested by Michigan Technological University. Of the 19 samples, only 2 failed to give the same results using the kit and laboratory analysis. Several sites that failed only that part of chemical criteria dealing with pyrophosphate extractable Fe + Al to clay ratio also failed the field kit.

The second group of samples taken from Ottawa National Forest in Michigan had laboratory data from the University of Minnesota and the field kit test conducted by Michigan State Univeriesty. Six of the thirteen pedons sampled by the kit contained spodic horizons. Laboratory data showed only one of the 13 pedons had a spodic horizon and that one didn't agree with the field kit. Several of the pedons that qualified had failed only the pyrophosphate extractable Fe + Al to clay ratio of the laboratory criteria for a spodic horizon.

The third group of pedons were sampled from Wisconsin. The NSSL ran the laboratory data and the Wisconsin SCS office the field kit test. They noted that most of the tests confirm the laboratory data whether spodic or not, but there are a few where the kit data is in opposition to laboratory data. They

No information was available for soils from Minnesota.

In summary, there seemed a tendency for the spodic horizon field kit to help in those cases where the pyrophosphate extractable Fe + Al to clay ratio was the only item of chemical criteria to fail and the actual clay content ranged from 5 to 13 percent.

It is of interest to note that of the samples that qualified via the field kit, most from the first group were on the basis of humic color; of the second group, some on humic color and some on aluminum; and of the third group, most were on the basis of aluminum.

The descriptions, laboratory tests, and field kit tests will be sent to NSSL for comparison with the results of other tests.

We recommend that the evaluation of the spodic horizon field kit be continued.

Conference participants expressed a strong desire to define the spodic horizon by morphologic field criteria without reference to chemical criteria. It is the recommendation of the workshop session of this committee that a definition acceptable to the NCSS, based on morphological criteria, be developed to identify a spodic horizon. There was a minority opinion, including the chairman, having some doubt about the success of this endeavor, based on past experience.

b. In "Soil Taxonomy," fragipans are considered genetic soil horizons and only soils with such genetic horizons should be identified in "fragic" great groups. This being the case, how should we identify, name, classify, and interpret soil layers that impede the movement of water and the growth of roots and that do not qualify as any other diagnostic feature; for instance, dense basal glacial till such as in the Grindstone series. In addition, many soils previously classified in "fragic" great groups have been shown by ongoing studies to lack genetic fragipans and should be treated in the same way. The Flak series is an example of this group. This region and the Northeast have a number of soils in this situation, so deliberations and recommendations by our committee would be appropriate. How should we identify these conditions, classify such soils, and interpret them?

Summary and Recommendations: The request on how to identify such things as dense basal till which impedes the movement of water and growth of roots and which in some instances has been included in soils grouped under fragipans received mixed reception.

Some suggested grouping with soils with genetic fragipans by expanding their range to include nongenetic layers.

Some suggested they should not be included in classes with genetic fragipans.

Another suggestion was to identify as a Cr horizon and recognize at the series level and no higher in "Taxonomy."

Other suggestions included setting up fragic subgroups to include (1) soils which have all other attributes of a genetic fragipan except they are brittle in less than 60 percent of the matrix of the horizon or (2) dense basal till which lacks most of the properties of a genetic fragipan.

Another suggestion notes that compaction caused by running heavy equipment over soil material during strip mining is a problem. He notes that some of these layers, although relatively thin, do prohibit or severely restrict root development almost as effectively as a uniformly dense layer. He suggests that a subscript "d" be added to the horizon designators and be used for these dense layers (including dense basal till). I don't know whether Committee 8 has considered this proposal.

During the committee meeting the possible definition of this dense basal till was discussed. A tentative definition would include an upper boundary within 40 inches of the soil surface, a bulk density of at least 1.8 (possibly 1.9) or higher, which continues or increases with depth throughout the entire section to the bottom of the till body, and exclusion of plant roots except along fracture planes.

The committee recommends that only those soils with genetically developed fragipans be classified in fragic great groups. Soils with dense basal till which is not a product of pedogenesis should not be classified in fragic great groups.

We also recommend that the C horizons of such soils be designated as a Cr horizon as described on pages 4-45 of chapter 4 of the Soil Survey Manual. These properites would be recognized at the series level in "Soil Taxonomy."

Following discussion at the conference, the committee made one change in the above recommendations. We recommend that the symbol d be added to the approved list of "Subordinate Distinctions within Master Horizons and Layer" on pages 4-43 to 4-46 of chapter 4 of the Soil Survey Manual and these horizons be labeled Cd rather than Cr as previously proposed.

c. Over the years, we have had a number of questions about the identification of very weak cambic horizons in medium textured materials.

In this region, cambic horizons formed in material weathered in place such as loess, glacial till, and most bedrocks, as well as alluvial deposits on terraces which no longer flood, almost always show a regular organic carbon decrease to levels of 0.3 percent or less within 50 inches of the surface in soils with ❑ ollic epipedons, or to less than 0.2 percent within 50 inches of the surface in soils without mollic epipedons and one or more of the following:

(1) Higher clay content in B than underlying material--clay formation from weathering in place.

(2) Evidence of removal of carbonates.

(3) Increased acidity as compared to underlying material.

(4) Lower base saturation than underlying material.

(5) Stronger chroma or redder hue than underlying horizons (just as often lower value than underlying horizons).

(6) Soil structure and absence of rock structure.

The most common combination is item (1) or item (2), or usually both. A few soils with high base status but without free carbonates within depths of 40 inches or so commonly have item (1) and item (3). There are a few low base status soils in shallow material over noncalcareous bedrock in which primary evidence is soil structure, increasing evidence of rock structure with depth, and commonly lower color value than underlying material.

We have a special situation in soils formed on the flood plains. Problem is most acute in those without free carbonates. Many exhibit none of the properties listed above other than structure which is usually weak in strength and medium in size and the seeming lack of visible fine stratification or rock structure. There is a question whether a structure this weak is really genetic or whether it is actually fragments of the material. Even though visible fine stratification is lacking, available laboratory data tends to indicate either an erratic decrease in organic carbon with depth or an organic content above 0.2 percent at a depth of 1.25 m below surface, or both.

Should we try to strengthen the minimal cambic horizon definition on the weakly developed soils on the flood plains?

Summary and Recommendations: Suggestions were variable, and it was noted that changes were difficult without influencing soils that we didn't want to disturb. One suggested adding a requirement for lower base saturation and increased acidity. This might be added as an additional requirement where only soil structure (item 4 d, page 36 of "Soil Taxonomy") is used as evidence of a cambic horizon. A quick check of supportive data for the Dystrochrepts formed in acid materials suggests that this requirement might cause some of them to be classified as Entisols if required to have more acid B horizons with lower base saturation than underlying material.

Several states have objected to taxonomic units in drainage sequences being classified in two orders. We have several drainage sequences in which the soils with aquic moisture regimes are Entisols (Fluvaquents) and those lacking an aquic moisture regime are Inceptisols (Fluventic Dystrochrepts or Fluventic Eutrochrepts). In other drainage sequences, we use Fluvaquents and Udifluvents for a similar situation. The only difference is a weak cambic horizon justified primarily on structure which is usually weak as compared to the decision that another drainage sequence lacks a cambic horizon. There is possible duplication between some soil series classified as Udifluvents and other similar soils being classified in Fluventic subgroups of Dystrochrepts and Eutrochrepts.

We note that the data available for review for the various Fluventic subgroups of Dystrochrepts and Eutrochrepts generally indicates the following:

a. Either an irregular decrease in organic carbon content with depth, or an organic carbon content of more than 0.2 percent at depths of 1.25 m below the surface or both, or

b. In a number of instances, organic carbon isn't determined to a depth of 1.25 m, but in most cases that were reviewed:

(1) Organic carbon decreased irregularly or

(2) Is at a level of more than 0.2 percent at the greatest depth for which data was available. This suggests that these soils likely would fit item a above if additional data to greater depths was obtained.

In view of the above, it is suggested that all cambic horizons lacking aquic moisture regimes in Inceptisols be required to have a uniform decrease in organic carbon with depth to a level of 0.2 percent or less at a depth of 1.25 m below the surface. This should be tested more thoroughly, but preliminary testing suggests that this addition would group the Fluventic subgroups of Dystrochrepts and Eutrochrepts with the Entisol order.

This would take care of the objection to changing orders for a drainage sequence of soils with minimal development and the possible duplication between similar soil series noted previously.

Following a discussion by the committee during the conference, the majority of the members in attendance rejected the proposal to strengthen the cambic horizon definition. They did not consider the probable duplication between Udifluvents and Fluventic subgroups of Dystrochrepts and Eutrochrepts to be of concern. Committee members pointed out that drainage sequences of upland soils in many geographic areas in which the better drained sites lack mollic epipedons commonly have members in more than one order of "Soil Taxonomy" (Alfisols and Mollisols). Why should soils on flood plains be any different?

A number of other questions about "Soil Taxonomy" were noted by the committee members.

a. Several questions were in regard to criteria for wetness in "Soil Taxonomy."

(1) One member noted the different criteria at the suborder level for evidence of wetness for Aquolls, Aqualfs, Aquents, and Aquepts. He also could have added Aquods and Aquults to the list. He suggests that we ought to be working toward "fine tuning" the criteria and achieving better uniformity.

The chairman shares this concern about the morphological criteria selected for the various suborders.

A brief explanation might be helpful.

Aquic suborders

(a) First of all, each must have an aquic moisture regime or be artifically drained and

(b) Each must have morphological evidence of saturation for sufficient length of time to cause reduction and leave an imprint in the soil.

The morphological evidence listed in "Soil Taxonomy" is a summary and condensation of the morphology of actual pedons that these suborders were defined to include.

There was an attempt to relate this morphological evidence to the diagnostic horizons of the various suborders.

If we remember that all these Aquic Suborders must have an aquic moisture regime and certain morphological evidence, perhaps the criteria doesn't look so confusing.

(2) Some have objected to the idea that soils classified in Aquic Suborders have aquic moisture regimes. Specifically, one correspondent notes that in his state Udollic Ochraqualfs do not have a water table above 2 feet and, furthermore, usually do not need drainage.

If these observations are true, these soils apparently are misclassified. If they don't have an aquic moisture regime or artificial drainage, they are not Aqualfs. A water table no shallower than a depth of 2 feet any time during the year fails the Aquic Suborder definition.

Do we need to review the concept of artificial drainage? It can include tiling, ditching, surface leveling, road ditches, lowering of stream levels by incision, etc.

(3) Another question was raised about the length of time required for the saturation requirements to provide the morphological imprint of reduction called for in the various definitions of suborders. Research indicates that periods of continuous saturation on the order of 2 weeks with sufficient organic matter to provide a good energy source and high enough temperature for proper biological activity is long enough.

The correspondent notes that some soils in his area qualify for Aquic Suborders. A water table is present, but the duration of and the timing of the period of saturation is such that it is possible to manage these soils to produce high yields of crops without internal drainage systems. Geographically, the area being discussed is marginal to the ustic moisture pattern on the well drained soils and to the thermic temperature zone. He questions whether these are hydric soils or whether they need the "where drained" qualifer when designated as prime farmland. Under these special conditions the answer might be no in both cases.

In some ways, this is more the subject of the committee on interpretations than the committee on classification.

We have known that many Aquolls in Illinois differ from Aquolls in Nebraska and Kansas in the length of time they are saturated in most years, in the period of the year they are saturated, and in the depth to the water table during the time of year when they aren't saturated.

Perhaps with more study, we can better define the normal kind of saturation in Aquolls in the central and eastern part of the region and define a different kind in the western part of region and provide for an Ustic (?) Haplaquoll or some such name.

b. Another group of questions dealt with the status of proposed changes or amendments to "Soil Taxonomy." Questions dealt both with status of proposal and why it takes so long for acceptance and implementation.

(1) The status of the proposed revisions of "Soil Taxonomy" to provide for Limnaquents as a great group of Aquents and Limnists as a suborder of Histosols was questioned.

Apparently, the personnel changes in Washington and the reorganization of responsibilities since this proposal was submitted, along with the lack of followup by MNTC during the last several years, has resulted in this proposal being lost in the shuffle. Dr. Guthrie has been unable to locate copies of the material. Copies of all material dating as far back as 1975 have been forwarded to Dr. Guthrie. His office will review the material and provide a draft proposal for review and comment. We are particularly concerned about the apparent lack of soil series to fit many of these proposed slots. We commonly have not added categories to "Soil Taxonomy" until we had established series or at least pedon descriptions to document their need.

(2) What is the status of the proposed changes in definition of a paralithic content?

The National Headquarters will review the correspondence and formulate a proposal for review and comment.

(3) A proposal was submitted to the MNTC to support the addition of Fragiaquic Hapludalfs and Fragic Hapludalfs to "Soil Taxonomy." This proposal has been reviewed by the Regional Taxonomy Committee. A summation of its recommendations will be made and appropriate action taken as soon as possible.

The proposal essentially provides for the intergrade subgroups for soils with all properties of genetic fragipans except the requirement that 60 percent or more of matrix have brittle consistence.

3. Evaluate the merits of classification and correlation at levels above the series.

Summary and Comments: Correspondents had few comments on this charge. One committee member enclosed some material he had previously prepared as a reply to a proposal to map at the family level. I think the comments are appropriate and are applicable to other categorical levels as well as the family level. Excerpts from his discussion are as follows:

> I A 1. Mapping at the family class level would not necessarily decrease cartographic detail. I checked a recent order 2 survey in which 62 series had been mapped. The 62 series fit into 47 different family classes. The reasons for more than one series in a family class were generally position in the landscape and parent material. The times when two mapping units named with series from the same family class were adjacent to each other was negligible. In my opinion, good map unit design is more effective in decreasing cartographic detail.
>
> I A 3. Using the family class wouldn't simplify the correlation process but may make it more difficult. As I view it, the notes, background information, and pedon descriptions are still needed in order to evaluate reliability of the mapping and correctly determine the family class. The only shortcut might be that a description of the family class would not have to be submitted for establishment and review by other states in the same manner that a series description is established and reviewed.

I B 1. The family class is too broad for use in most survey areas. The full range of temperature, soil moisture, frost-free days, parent material, elevation, aspect, etc., allowed in a family class are usually not present. This means that only part, or a phase, of the family class is present. The soil series is a subdivision or phase of the family class. If the family class, instead of the series, is used as the named component in mapping units, the family class would have to be phased in most survey areas. I think that a second kind of phase, other than the soil series, of the family class would be confusing.

I B 2. Transfer of information from one survey area to another within a state or between states is no problem at the family class level if only one series is recognized in a family class and the interpretations for that series fit the situation in the new survey area. Even two or more similar series in a family class from a given geographic area would not be a problem. It is a family like the loamy-skeletal, mixed, mesic Typic Dystrochrepts which occurs over a wide geographic area that causes problems Series from this family are recognized in Maine, Pennsylvania, Tennessee, Wyoming, Oregon, and a number of other states. The engineering interpretations on the series in this family may be quite similar, but the woodland and range interpretations are different from one area to the next. Using the series name selected to represent the family would help in this situation, but more than one series is needed to cover the water front.

I B 3. In order to do a reliable job, the survey party would have to write just as many pedon descriptions, do just as many transects, and write just as many field notes. After all of this investigative work is done, it is a simple step to propose a series and have it approved. Mapping at the family class level seems to imply to some of the users that a quality product can be produced without all of the time-comsuming notes, pedon descriptions, and so forth. All of us have seen soil surveys made without any documentation using the soil series, and most of these were mediocre at best. The survey at the family class level without documentation would be the same.

I C 1. Phasing of families is a necessary refinement, and the series is a traditional way of subdividing the family class. Developing another system of subdividing family classes other than the series would be counterproductive and confusing. Incidentally, most research carried on by the land-grant universities is performed on soil series. Identifying and relating such research developed for series with similar properties to map units named at levels above the series would be difficult or nearly impossible.

II c. The solution to many of the problems is not in the use of the family class in mapping but rather lies in mapping unit design. In many surveys, we could be using more complexes and associations and, thereby, avoid cumbersome detail. Quite frequently, the mapping unit is a complex or association, and the significant components are in different orders or suborders. We would still need the complex mapping unit or association if we were naming the mapping unit with series names or at the order of suborder level. -The user's main interest is the potential use of the soil. The user sees the map unit as the vehicle which gives him the interpretations he desires.

In summary, some of the considerations of correlating at levels above the series deal with defining the units, transferring of soil survey information to other areas, providing unique names, relating such units to the research that has accumulated by soil series over the years by land-grant universities and other agencies, and the difficulty in providing interpretative records for such units within the framework we are presently using in the NCSS.

4. Discuss and evaluate current trends in the classification and correlation of eroded soils, including eroded soils in sandy families.

Eroded phases of soils provide map unit names in many of our soil surveys. Several references deal with the philosophy of and the reason for eroded phases in a soil survey. These references are:

a. Soil Survey Manual, 9/11/80, chapter 5, pages 17-18.

b. National Soils Handbook, Draft 1981, section 301.5, pages 38-42. Part of the material from NSH is reproduced below:

"(F) Phases of Eroded Soils. Eroded phases of a soil are based on significant differences in land use suitability, conservation needs, input requirements, or yields that are due to accelerated erosion. Potential for erosion is not a criterion of phases of eroded soil. Phases of eroded soil are based on a comparison of the suitability for use and the management needs of the eroded soil with those of the uneroded soil. The phase of the eroded soil is identified on the basis of the properties of the soil that remains. An estimate of the soil lost is described.

"Phase separations should be made on the basis of relative differences in use and management due to erosion and not on the basis of class definitions. Rarely are more than two-phase separations necessary. Eroded soil phases are defined so the boundaries on the soil maps will separate (1) soil areas of unlike use suitabilities and (2) soil areas of unlike management needs and responses to management. If a tentatively listed eroded soil phase turns out to have the same predicted use, management needs, and response to management as another similar phase of the same taxon, the two are combined.

"Most uneroded cultivated soils have class 1 erosion. Phases of soil eroded by water are defined as follows:

" - Moderately eroded soil phase. Erosion has changed the soil to such an extent that the set of management practices needed or the response to management differ in major respects from those of the uneroded soils, but suitability for major uses such as field and horticultural crops, pasture, or forestry are the same. The distinction is made by comparing the set of management practices needed on the eroded phase with those needed for efficient production and erosion control on the uneroded soil. The word "moderately" is omitted from the name unless it is needed to differentiate between this phase and other eroded phases of the same soil. Soil areas designated as moderately eroded have surface features mostly within the limits of class 2 erosion.

"- Severely eroded soil phase. Erosion has changed the soil so either (1) the most intensive land use (including trees) to which the soil is suited is at least one use-class less intensive than that for the uneroded soil, such as use for pasture instead of small grain, or (2) the eroded soil needs large inputs immediately or over a long period to be suitable for uses as intensive as those of the uneroded soil. Soil areas designated as severely eroded have surface features mostly within the limits of class 3 erosion."

Within that framework, two topics we could address are:

(1) Develop ways to consistently identify eroded phases of kinds of soils, and

(2) Document how the eroded condition affects the suitability for use and the management needs of the eroded soils as compared to an uneroded phase of the same soil.

Summary and Recommendations: Several correspondents indicated that the NCSS needed to pay more attention to the identification of and justification for eroded map units.

There was no consensus reached on how to identify the eroded condition. Suggestions included surface thickness phases or proportion of mixings of subsoil in the Ap horizon. One astute observer objected to the definition of erosion in terms of surface thickness phases because soils did not have the same thickness of surface before they were disturbed, cleared, or plowed. The chairman agrees with that observation.

The chairman suggests that the definition of erosion must be related to the normal range in variability of the thickness of the surface layer of the uneroded map unit of the same soil series on the same slope to develop a definition of the eroded condition on that slope.

Some of the things influenced by increased erosion include more runoff, lower fertility, increased power and fuel needed for seedbed preparation, erodibility because of poorer physical condition, increased crusting, reduced seedling emergence, reduction in yields, and decreased net income per acre. How much difference is significant? The chairman suggests that a difference of at least 10 percent in one or more of some of these items might be a minimal level of significance for an eroded phase.

It is noted that eroded phases tend to have less organic matter in surface layers as compared to uneroded phases. Whether this fact influences any other properties than noted previously is not clear. Herbicide treatment is one property influenced by organic matter, but it would certainly take more than a 10 percent difference to have a significant influence.

Documentation should be available to support eroded map units which are based on differences not reflected in yield tables, management statements, or suitability statements in the map unit description. Justification based only on significant differences in input requirements needs careful documentation. Such documentation might include farmer experience, statements in more detail from the technical guides for the survey area, research reports on similar kinds of soil, and unpublished research and observations.

The committee agrees that eroded phases of a soil that are recognized as map units must be based on significant differences in land use suitability, conservation needs, input requirements, or yields that are due to accelerated erosion.

5. Related items of concern and/or interest to you. The chairman of committee 6 suggested two items for discussion.

a. Soil correlation problems in the Midwest. We seem to be having more problems with our surveys at the final correlation than we had several years ago. This could be due to acceleration of soil surveys, more limitation on travel, other priority assignments, and the reduced number of state staff personnel which results in:

(1) Less attention and quality control to surveys by both party leaders and state staff.

(2) A letdown in the followup work.

(3) Less input in the preparation for the final correlation.

(4) An increase in the number of final correlations that are handled by mail and telephone.

How can we maintain a high level of quality within the restrictions of time and manpower of the present and that we expect in the next several years?

<u>Summary and Comments</u>: Few comments were submitted, and few agreed that there were increased problems. The only constructive comments noted that if guides in NSH were followed and everyone did their part during the survey and in the preparation for the comprehensive review, most of the problems will be taken care of before final correlation. "Everyone must do their part throughout the course of the survey and not leave it up to the correlator to work out the problems at the final correlation."

It appears to us that we can reduce the number of soil correlation problems that we have been having at the final correlation conference by the following:

(1) We should see that the dates listed on the CASPUSS schedule are reasonable and accurate so the various aspects of the survey can be completed in an orderly manner.

(2) We need to place more emphasis on joining throughout the course of the survey. This includes interpretations as well as map unit names.

(3) Laboratory data needs to be reviewed thoughly shortly after it is received so there will not be any "surprises" at the end of the survey.

(4) We need to critically compare all typical pedons and their description to the official series descriptions and take the necessary action for those that are outside the range of the series.

b. The definition, use, and interpretations for variants. Recent correspondence suggests doing away with the use of variants. The problem is the lack of stored interpretation records for these units. This is a particular problem for such things as the national resource inventory, multicounty management areas, and in the identification of important farmlands. Should our committee attempt to develop a statement about the use of variants in the soil survey program in the north-central region?

Summary and Recommendations: We suggest that the use of variants be continued in those cases where that seems the best policy and that interpretation records for the variants be maintained. We understand that record numbers for variants are being maintained at Ames. As soon as the states have completed their updating, interpretations will be available via Ames for variants as well as series.

Recommendation: It is recommended that Committee 6 be continued. One suggested charge to the committee deals with identification of the morphological criteria by which a spodic horizon could be identified (See charge 2, item a., pages 3 and 4 of this report.)

Membership--Committee 6--Soil Correlation and Classification (Including Forest Soil Classification)

*Robert I. Turner, Chairman
"Richard H. Rust, Vice Chairman
James G. Bockheim
"James A. Bowles
Louie L. Buller
*Robert G. Darmody
*Thomas E. Fenton
Ronald J. Kuehl
Jerry D. Larsen

Donald R. Mapes
*Richard E. Mayhugh
*A. Steven Messenger
J. Wiley Scott
Eunice A. Steidinger
Neil W. Stroesenreuther
*Bruce W. Thompson
Larry D. Zaveskey

*In attendance

Attachment No. 1

Implications of 10 Percent Yield Differences in Net Returns and Land Values

T. E. Fenton

I am quite interested in this aspect of soil survey, and because the conference chairman listed it as a committee charge, I did some calculations for present Iowa conditions.

Billy Murray's landlord capitalization method for determining land values was used. The following assumptions were used in this income capitalization procedure:

1. Landlord receives one-half of all crops.
2. Landlord pays one-half of seed, chemical, fertilizer, and drying expenses.
3. Landlord supplies facilities for storage.

For expenses, I used the "Estimated Costs of Crop Production in Iowa--1982" FM-1712, Cooperative Extension Service, Iowa State University. I used the corn following soybeans costs for the corn expense and soybeans following corn for the soybean expense. Expenses are given for three different yield levels of both corn and soybeans. I used the cost associated with each of those three levels to calculate net returns for each yield level. Storage charges are for a l-year period. These costs are given in table 1.

Net incomes using these expenses for a given yield level were calculated for corn at $2.50, $3.00, $3.50, and $4.00 per bushel selling prices. Net incomes were calculated for soybeans at $6.00, $7.00, $8.00, and $9.00 per bushel selling prices. These incomes were capitalized at 6.5 percent. Regression equations were calculated relating yield level to the calculated land values for a given set of conditions. Then each yield level was increased by 10 percent and substituted in the regression equation.

For example, for corn at $2.50 per bushel, the regression line was calculated using the three cam yields 140, 115, and 90. The capitalized land values calculated from the net returns were $1,443.11,$1,042.03, and $869.56, respectively. Each of these yield levels was increased by 10 percent and the trend line used to determine the land value associated with that yield. Thus, the effect of a 10 percent yield difference for three different yield pairs--90-99, 115-127, and 140-154--can be compared for a range of commodity prices. This data is reported in table 2 together with the same type of values using soybeans. To determine the land value associated with a corn-soybean sequence, take each of the individual values for the parameters selected and average them. Land values obtained by this method will change depending on many factors, but the capitalization percentage chosen is one of the more critical ones. The one used, 6.5 percent, is commonly used here.

Table 1. Iowa per bushel expense for landlord income, 1982.

Corn Yield Bushel/Acre	Seed, Chemical, Fertilizer	Drying	storage	Total
	----------Dollars----------			
90	0.337	0.05	0.235	0.622
115	0.326	0.05	0.235	0.611
140	0.293	0.05	0.235	0.578
Soybean Yield Bushel/Acre				
30	0.77	__	0.235	1.005
38	0.66	__	0.235	0.895
46	0.584	__	0.235	0.82

Table 2. Land values calcuated using corn yields and soybean yields.

$/ Bushel	Land Values Calculated Using Corn Yields (Bu/Acre) 154	140	127	115	99	90
$2.50	1,594.95	1,443.11	1,285.23	1,130.02	964.03	869.56
$3.00	2,187.42	1,981.59	1,773.35	1,572.80	1,344.96	1,215.72
$3.50	2,779.73	2,520.06	2,262.32	2,015.13	1,725.73	1,561.89
$4.00	3,372.06	3,058.54	2,750.80	2,457.45	2,077.03	1,899.44
	Soybean Yields (Bu/Acre) 51	46	42	38	33	30
$6.00	1,736.93	1,542.80	1,385.75	1,227.72	1,034.57	918.48
$7.00	2,129.25	1,896.66	1,708.84	1,520.04	1,288.42	1,149.26
$8.00	2,521.55	2,250.50	2,031.91	1,812.35	1,542.27	1,380.03
$9.00	2,913.88	2,604.37	2,355.01	2,104.67	1,796.13	1,610.81

For corn, the differential of 10 percent results in a $94.47 difference in land values at the highest price and yield. At the highest price and yield level, the 10 percent difference in yield results in a $313.52 difference in land value. The minimum land value calculated with the corn data was $869.56 and the maximum value was $3,372.06.

For soybeans, the trend is the same except the 10 percent yield differential results in a $116.00 difference at the highest yield and price. At the highest price and yield for soybeans, the 10 percent differential results in a $309.50 difference in land value.

The minimum land value calculated using the soybean data was $918.48 while the maximum was $2,913.88. Soybean yields would have to exceed 52 bushels per acre for the stated conditions for land values to exceed $3,000 per acre.

The analyses indicate that the 10 percent yield difference when capitalized into land values is a significant difference. A brief inspection of the data shows the difference of 10 percent yield results in roughly a 10 percent change in land value for the stated conditions.

North Central Regional Work-Planning Conference
of the Cooperative Soil Survey

Fargo, North Dakota
May 3-7, 1982

Committee 7 Report
Using Soil as a Medium for Treating Wastes

Committee 7--Using Soil as a medium for treating waste has five members. Two members were able to attend the meetings. Other committee members offered suggestions and comments in writing.

The charges given to the committee were to:

1. Develop a mechanism for collection and dissemination of waste application research results.

2. Update the waste disposal information available since 1980.

3. Develop additional related items of interest to committee members.

Committee members suggested additional charges prior to the meetings.

These charges were to:

4. Discuss possible methods to improve basic soils information that would be used for making waste disposal interpretations.

5. Develop a mechanism to receive and process data so interpretation can be changed and updated.

6. Critically review the 1980 revision of Section 403 of the National Soils Handbook dealing with Waste Management.

During the pre-meeting correspondance no volunteer was identified to prepare an update on current research activities in the region. During the meetings many expressed the desire to receive updates on materials available in the region. The address of the North Central Regional Education materials at Center, 111 Curtis Hall, Iowa State University, Ames, IA 50011 was listed as a source of many of the regional materials. Lists of references received by Jerry Tyler are included as an appendix to this report. A copy of the Small Scale Waste Management Project of the University of Wisconsin at 1 Agricultural Hall, Madison, WI 53706 was distributed at the meeting.

The committee recommends that everyone bring at least display copies of materials believed to be of interest to the group to future work planning conferences.

Several states including North Dakota, Ohio, Iowa, Nebraska and Wisconsin are currently doing waste disposal research. Brief reports on these activities were given. It appears that the variety of work is great and depends on local demands and priorities.

Basic information needs for waste dispoal interpretations were discussed at length. Committee members agreed that waste disposal techniques were getting more sophisticated and that there were more designs and types of wastes for soil disposal. The more sophisticated and the greater the variety of disposal methods the better basic soil data needs to be to properly site and design systems. Therefore, it was the opinion of committee members present that efforts to define more closely the quality of data in existing soil survey reports, should be increased and additional efforts should be made to increase the quality and the quantity of data in future reports.

Current information quality undoubtedly varies greatly. Reassessment probably could improve the reported data but the mechanism to do that and the cost of such an effort was not addressed. The group recognized the importance of informing soil survey users of the quality and variability of soil survey data. Also, the group discussed that mappers and party leaders should be encouraged to record and report as much information as possible.

Additional information recognized as being needed in soil survey reports was soil water characterization data including moisture release and saturated and unsaturated hydraulic conductivity values. Other specific items needed to be included were not mentioned.

Two items from the list of charges including a review of Section 403 of the National Soils Handbook and a procedure for incorporating data in the system for reinterpretation were not addressed.

The members present felt that Committee 7--Using soil as a medium for treating waste should be discontinued because:

1. Interest is decreasing as reflected in fewer people on the committee and,

2. Many of the issues being addressed, such as research literatuare distribution, means of improving basic data input into the soil survey. and developing potential ratings are being attacked by other committees. Therefore, the activitiesof the committee are being duplicated and would continue even without transferring charges.

Committee members:

Jerry Tyler* Chairman
Steve Base Vice Chairman
Jim Anderson*
Ted Zobeck
Joe Yahner

'Present at work planning conference.

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CONFERENCE SUMMARY REPORT

Committee .8 - NRCWRC
May 3-7, 1982
Fargo, North Dakota

Committee 8: Classification, interpretation, and modification of soils on mine spoils and disturbed soils.

Background: Committee 8 consisted of 10 members. Seven members were present at this conference. Six members responded by letter, or phone, to the charges of this committee. A list of committee 8 members are appended.

For this report committee charges are followed by comments and recommendations received and reviewed by mail, phone and at the conference.

Charge 1: Provide an updated summary of research in the classification of drastically disturbed lands, mine spoils, tailings, wastes, etc.

Illinois has proposed four soil series for surface mine spoil materials. They range from fine loamy to fine silty, mixed calcarous and non-acid; mesic, Typic Udorthents. All are the result of excavation, grading and reclaimed. According to the pedon descriptions all have an Ap, no B and numerous C layers that are very hard and firm. Some mined land is extremely acid and contain sulfides: Pedon characterization data are incomplete. These soils can be mapped consistently once mining method and overburden materials are known. They are considered prime farm land when slopes are 5% or less. Illinois is using one of Ohio's mined land series that contains a high proportion of coarse fragments.

Ohio has established four series and one tentative series. They are loamy-skeletal, mixed to siliceous, acid to calcareous, mesio, Typic Udorthents.

They are the result of excavation, stock piling, grading and reclaimed. Because of the nature of the stripped country rock in Ohio, these soils contain a higher proportion of coarse fragments than most Illinois series. Sulfides are mentioned in these series that are extremely acid. An important interpretative observation.

Neither Michigan nor Missouri have proposed any soil series for mine wastes. Michigan has lab characterization data for 8 pedons from iron mine tailings. Tailings are the solid portion of an effluent deposited in engineered basins. They are water deposited wastes contrasted to mechanically deposited coal mine wastes series. They range from sandy to fine silty with mixed mineralogy.

Conference comments stressed the development of good mapping unit descriptions. Committee 2 also stressed the importance of good mapping unit descriptions emphasizing disturbed land properties and their ranges. Within the North Central Region mine lands are classified and correlated as other lands.

In general, the committee does not feel that this charge be continued and it was recommended to be discontinued.

Charge 2: Determine the soil properties and the ranges in those properties which are important to reclamation with the region. Without regard to soil series, as a basis for use in interpretations on mined lands.

Jerry Post, NTC, furnished a suggested minimum standards data sheet for soil properties after reclamation of rural abandoned mined lands for various planned land uses. It is titled "Resource Management Systems for Abandoned Surface Mine Areas," Midwest TSC Consv. Opera. Bull. No. M 12-9-3 dated 11/3/78. This document outlines soil property limits for planned land use on reclaimed surface mined areas. (Copy appended)

Responses to these charges indicates that research is underway in developing mine waste properties critical to reclamation. Several series descriptions mention properties that could be important to reclamation. Illinois describes C horizons as very firm and hard, which would limit root development and Ohio mentions sulfides indicating a potential extremely acid growth medium.

Dr. I. Jansen, Univ. of Ill., emphasized the importance of observing the physical condition of mine wastes so they can be effectively mapped to alert the user to the proper reclamation method to create the most desirable physical condition. Dr. Jansen's rational is based on field research studies in which three types of physical conditions were evident. They are Type 1, no structure, mineral grains as one continuous mass, very massive and common with grading of cast over burden: Type II, massive with some density layering common where selected material is placed with pan scrapers; Type III, wheel dug, transported by belt and subjected to minimal grading. An artificial structure is apparent. Type III spoils are less restrictive to plant root development and water movement than Types I and II.

During the conference discussion brought out other items of concern for this charge. They are: Variability in spoil chemical and physical properties limiting, or important to vegetation establishment, e.g. SAR values, organic matter, salts, partical density, acid forming materials, deep plowing or chiseling on dewatered, non acid, low proportion of coarse fragments, compacted, reclaimed mine land.

In general, the committee emphasized the importance of this charge and to select critical properties by region since the same distrubed land property critical to reclamation may not be the same throughout the region.

It was recommended that this charge be continued. Furthermore, this committee is to undertake the task of developing a table, by state, showing these mine spoil, or disturbed land, properties and their variability critical to reclamation.

Charge 3: Continue to summarize results of reclamation research on old mine and other disturbed areas which result in an improved medium for plant growth and evaluate the performance of soils reclaimed under Public Law 95-87.

Missouri is involved with RAMP projects but it is too soon to determine success of reclamation. These projects are interdisciplinary teams composed of agronomists, foresters, engineers, wildlife and environmental specialists, soil scientists and geologists

Although Michigan has Public Law 95-87 problem areas, monies for research have not been appropriated.

During the conference the committee learned that RAMP programs are on the decrease. The committee recommended that this charge be dropped because of a lack of funding and projects.

Charge 4: Evaluate the applicability of the Universal Soil Loss Equation as a basis for erosion control planning during the mining process and after reclamation efforts have been completed.

No studies reported for use of Universal Soil Loss Equation for erosion control planning during the mining process. Comments concerning this charge indicate that it should be used after reclamation than during the mining process.

However, on those interpretations sheets for mine waste soils, k factor values should be revised as additional information becomes available.

In general, the committee agreed to maintain this charge as though there is limited data for this subject. It was recommended that Dr. William Moldenhour, ARS Soil Erosion Lab located at Purdue, be contacted and a dialogue established concerning erosion on disturbed lands and mine spoil materials.

Charge 5: Consider the problems of compaction and subsidence often associated with reclamation and evaluate current methods of alleviating these problems.

Compaction is one of the main problems and concerns of reclamation specialists. Missouri currently has oneresearch project on a reclaimed clay pan soil. Major concern with compaction is trafficability when wet, restriction of root development, and increased surface water runoff.

Committee discussion of this charge emphasized its importance. However, the committee recommends that it be dropped and combined with charge no. 2.

Summary

Several states have proposed and established soil series for mine wastes materials. They are all Udorthents. Reclamation research is active in most states with these kinds of disturbed lands. Use of USLE k factors are often one of judgement and those that are in use on these kinds of waste materials should be evaluated and revised as data becomes available. Compaction and spoil properties such as structure and their effect on plant establishment and water relations in spoil materials is a major item of concern. A summary of Cooperative Research Information Services (CRIS), listing mine waste research projects in several North Central States, accompanies this conference report.

As a result of the formal committee meeting, and its preconference report, Committee 8 has the following recommendations:

1. Committe 8 be continued and that they concentrate on the following charges.

   1.1 Determine the properties and their variability which are important to reclamation activities in the region. Properties are to be site specific by state, and, to include oil exploration sites.

   1.2 Establish a dialogue with the ARS Soil Erosion Lab located at Purdue for progress in developing USLE k factors on mine wastes and disturbed lands.

2. Committee 8 should be composed of a member from each state since all NCR states have mine spoil as well as other disturbed land classification, interpretation and soil modification problems.

Committee 8 Membership for the May 3-7,1982 NRCWRC

Stephen G. Shetron	Chairperson
Wells F. Andrews	Vice-Chairperson
Lester J. Bushue	
Richard L. Christman	
J.B. Fehrenbacher	
Ivan Jansen	
Don Patterson	
G. Post	
Earl Voss	
E. Doll	
K.D. Vogt	

[redacted]

Soil Properties	Cropland	Hayland	Pastureland	Rangeland	Woodland	Commercial Recreation la	Noncommercial Recreation la	Wildlife land	
Slope (percent) maximum	15	20	30	40	40	15	50	50	1/

2/ Depths shown may or may not provide sufficient available water capacity in the wet zone for plant growth depending on the texture of the soil materials.

3/ Root zone depth assumed to be 48 inches.

4/ pH of acid surface layers is to be adjusted by incorporation of lime to levels required for satisfactory growth of vegetation required for the land use. Soils with sodium absorption ratio (SAR) above 12 may need treatment. The amount in either case is determined by soil tests.

5/ Shale materials and other coarse fragments that weather rapidly may be a higher percentage by weight.

6/ Heavy metals must be buried to depths below the root zone for cropland, hayland, pastureland, rangeland, and wildlife land to avoid incorporation in food chain. Depths are for root formation and may not be adequate for water quality needs.

Note -- Treatment and restoration shall equal or exceed the *requirements* of applicable Federal, State, and local laws.

Objectives -

I. Essential treatment to maintain sustained use of the resource base.

* A. Surface water disposal - The resource management system selected shall provide for the delivery (or flow) of surface water runoff to ,a legal outlet or natural water course without creating gullies. Performance will be determined by visual observation. This standard is met if there is no visual evidence of gullies in the watercourse on the mined area or sedimentation in the watercourse immediately downstream from the mined area. Surface water shall not be diverted or discharged into underground mine workings.

* B. Water erosion control - The predicted average annual soil loss shall not exceed 5 tons per acre per year. The soil erodibility factor (K) shall be determined by onsite inspection of the soil materials. The Universal Soil Loss Equation will be used to make the prediction.

* C. Wind erosion control - The predicted average annual soil loss shall not exceed 5 tons per acre per year. The erodibility factor "I" will be determined by onsitc inspection of the soil materials. The wind erosion equation will be used to make the prediction. If both wind and water erosion hazards exist, the combined average annual predicted soil loss shall not exceed 5 tons per acre per year.

* D. Site preparation - LAND RECONSTRUCTION (Abandoned Surface Mined Land).

* E. Toxic materials - Acid and/or other toxic materials shall be buried deep enough to allow for establishment of vegetative cover suitable for the planned land use and placed so as to minimize contamination of ground water systems.

* F. All reclaimed lands shall be revegetated using one or more of the following conservation practices depending on the intended land use:

    1. CRITICAL AREA PLANTING -All land uses
    2. TREE PLANTING - Woodland
    3. PASTURE AND HAYLAND PLANTING - Pastureland or Hayland
    4. RANGE SEEDING - Rangeland
    5. CONSERVATION CROPPING SYSTEM - Cropland

* G. All reclaimed lands shall be fertilized and limed as needed to maintain vegetative cover. Fertilizer analysis and rates shall be determined by soil test. Actual application rates shall not be less than the recommended rate or more than 1½ times the recommended rate.

H. Perennial streams shall not be channelized. This pertains to the overall widening, deepening, realigning, or construction of a protective lining over all or part of the perimeter of the channel.

* I. Eroding streambanks of perennial streams shall be stabilized - STREAMBANK PROTECTION,.

II. Additional treatment necessary to improve quality in the environment.

* A. The application of all pesticides and other chemicals shall comply with uses and instructions on the label.

B. Reclamation in areas of high public visibility and those 'associated with recreation should be designed to be visually desirable.

III. Additional treatment necessary to improve quality in the standard of living.

A. Restore the area to a higher economic use.

* These items are required to make the resource management system a best management practice.

Summary of CRIS reported research involving
mine and other disturbed lands.

STATE	Title of Project
Illinois	The economics of surface and underground mining and Illinois agriculture.
"	Potential contribution of sediment to surface waters from the erosion of surface mined lands.
"	Agricultural benefits and environmental changes from use of organic wastes on field crops.
"	Reclamation of surfaced mined lands (characterization studies).
"	Influence of loess and till on soil development in Illinois.
"	Use of anaerobically digested sludge for reclamation of strip mined soils as pasture lands.
"	Improvement of the Palzo ecosystem with select vegetation. (toxic wastes)
"	Use of remote sensing in monitoring changes in forested acreage due to surface coal mining.
"	Variations in infiltration and sorptivity due to different surface mining activities.
Indiana	Characteristics of mine land overburden due to short term weathering.
"	Technique for the establishment of plants on disturbed soil areas.
Iowa	Deep tillage studies on reclaimed loess and glacial till.
"	Soil profile characteristics of restored soils at a coal surface mine.
"	Establishment of several crop rotations on restored soils at a coal surface mine:
"	Post-restoration agricultural management of reclaimed coal surface mines.
Missouri	Characterization of properties of strip mine spoils as related to remost sensing measurements.
Ohio	Hydrology and water quality of watersheds subjected to surface mining.
"	No-tillage grain crop production on land reclaimed following strip mining.
"	Reclamation of strip mined land in Ohio - methods of restoring vegetation.

STATE	Title of Project
Ohio	Mineralogy of Ohio soils and stream sediments - (natural and strip mine soil studies for iron-oxide).
"	Reclamation and management of strip mined land in Ohio for agronomic crops.
"	Hydrology and erosion of watersheds subjected to surface mining.
"	Use of sewage sludge to improve tree growth on acidic Ohio strip mine spoils: Boron toxicity problem.
Kansas	Soil-site, nutrients and multiple cropping of important Kansas hardwoods. (Black walnut on strip mined lands).
North Dakota	Resource inventory, monitoring, and analysis system (RIMAS).
"	Economic impacts of energy development and use on agriculture and natural resources.
"	Reclamation and management of saline and sodic soils.
"	Reclamation and management of strip-mine spoils in the northern plains.
"	Factonaffecting productivity of reclaimed mined lands.
"	Protection of soil, water, and air resources on mined land - new land reclamation technology.
"	Initial and developed physiochemical characteristics of soils spread over sodic mine spoils.
"	Crop and forage establishment, production and utilization on reclaimed disturbed land.
"	Plant establishment and culture on surface-mined lands.
"	Surface and root zone hydrology of shaped surface-mined spoil banks and rehabilitated land.
"	Chemical and physical characteristics of shaped mined lands and their effects on plants.
South Dakota	Environmental improvement and multiple use management in the northern high plains. (plant establishment on mine spoils)
Wisconsin	Native vegetation restoration of open-pit mine sites.
"	Field response of prairie species planted on iron-ore tailings under different fertilization rates.
"	Soil development and slope stability on Pb-Zn mine floating tailings.

STATE	Title of Project
Wisconsin	Evaluation of metallic mine tailings and of their potential.
"	Distribution and numbers of breeding birds on surface mine coal lands.

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February 1983

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Computer Storage and Retrieval of Soils Information

Neil E. Smeck

In the North-Central Region, computers are being employed for: 1) laboratory data and pedon description handling and storage and 2) map storage and generation of interpretative maps. Nearly every state in the region has, to varying degrees, utilized computers for one or both of these purposes. The hardware available in each state as well as the software packages are generally comparable.

In Ohio, laboratory data and pedon descriptions are processed with an interactive terminal linked by phone to a DEC 20/60 computer. The software consists of an array of small programs. Individual programs are available for calculations of particle size and textural classes, extractable bases, calcite and dolomite content, and clay mineralogy estimates; to combine data in a format for distribution; to edit data; for data storage; and for word processing of pedon descriptions. An array of small programs is used rather than one large program because it is faster and less expensive.

A copy of the coding form and legend, which are used to enter pedon descriptions, is attached. Pedon descriptions can be printed out in a narrative form by using word processing techniques or in a tabular form suitable for publications. Both the stored descriptions and data can be entered in the national pedon data bank by simply writing a program to convert one format to the other.

Most states in the North-Central Region have some experience with digitization of soil maps and the generation of interpretative maps. Digitization basically consists of entering data identified with x and y coordinates. The following techniques for digitizing soil maps are listed in order of increasing sophistication and cost: 1) Grided cell, 2) Linesegment, 3) Polygonal enclosure, and 4) Automatic scanning.

Whereas soil scientists are primarily concerned with digitizing soil maps, other types of geographic data bases such as land ownership, land use, surface cover, bedrock, and political boundaries, are also stored in data banks and quite useful in making interpretations. Once a soil survey or other geographic data base has been digitized, the data can be retrieved in the form of a computer generated map. However just the ability to retrieve a geographic data base cannot justify the effort required in digitizing the data. The real benefit from digitization is the ability to generate interpretative maps by either 1) overlaying two or more data bases or 2) displaying or selecting and combining external attributes of the data base. In order to employ the latter technqiue, an external attribute file must be developed for each geographic data base and placed in the data bank. An external attribute file for a soil map would include properties which are a function of soil such as texture, infiltration, permeability, drainage, available water holding capacity, organic matter content, and any other soil property for which information is available. Information in the external attribute file can also be retrieved in the form of a map, but more importantly, these properties can be combined to generate interpretative maps. For example, by utilizing information on slope, flooding hazard, permeability, water table depths, and texture from the external attribute file, a computer program can be developed to evaluate the suitability of each cell for on-site home sewage disposal systems and to display the evaluations as a computer generated map. In a similar manner, interpretative maps can be generated for highway locations, sewage lagoons, agricultural productivity, zoning, tax assessment, and many others.

A list of publications available in the North Central Region concerning computer applications in soil survey is attached.

OHIO STATE UNIVERSITY SOIL CHARACTERIZATION LABORATORY
PROFILE DESCRIPTION FORM

Soil Series ____1____ **Texture** ____2____ County ____3____ Site ____20____

Pedon Classification ____4____

Location ____5____ Sec ____6____ T ____7____ R ____8____ Physiography ____9____

Elevation ____10____ Topography ____11____ % Slope ____12____ ~~Slope~~ Aspect ____22____

Drainage ____13____ Vegetation ____14____ Collectors ____ / ____15____ / ____

Date P a / r / e n t Materials 1. ____17____ 2. ____16____ 3. ____19____
16

Horizon	Depth		Boundary	Matrix Color	Mottles								Texture		Co Frag	Structure					
																Primary			Secondary		
	Up	Lw			Color	A	S	C	Color	A	S	C	Md	Class		G	Si	Typ	C	Si	Typ
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

Horizon	Con	Reaction		Surface and Matrix Elements												Roots	
		pH	Eff	Knd	Loc	A	Color	Knd	Loc	A	Color	Knd	Loc	A	Color	Ab	Si
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

Notes

CODING ABBREVIATIONS FOR SOIL SURVEY PROFILE DESCRIPTIONS
OHIO STATE UNIVERSITY SOIL CHARACTERIZATION **LAB**
May, 1982

SOIL INFORMATION

Soil series

Surface texture-(use standard abbreviation; e.g., sil, vfs, etc.)

County

Classification-include complete classification according to Soil Taxonomy, 1975.

Location-Use S-point system, e.g., 205 ft N and 225 ft W of SE corner **Sec 31** T **27N** R **2W.** If not applicable use either, State Plane, UTM, Grant, Donation, or **latitude-longitude.**

Physiography

Depositional **landscapes**

FP = Floodplain
RT = River, stream terrace
ST = Slackwater terrace
OP = **Outwash** plain
LP = Lake plain
BR = Beach ridge
SD = Sand dune
RM = Ridge moraine
GM = Ground moraine
CD = Closed depression
KA = Kame
ES = Esker

Erosional landscapes

SU = Summit
HS = Headslope, shoulder
HB = Headslope, backslope
HF = Headslope, footslope
SS = Sideslope, shoulder
SB = Sideslope, backslope
SF = Sideslope, footslope
NS = **Noseslope,** shoulder
NB = Noseslope, backslope
NF = Noseslope, footslope
BE = Erosional Bench

Elevation-give in feet or meters.

Topography

NL = Nearly level **(<1-3%)**
GE = Gently sloping **((1-3)-(5-8)%)**
MO = Moderately sloping
ST = Strongly sloping **((5-8)-(10-16)%)**

MS = Moderately steep ((10-16X20-30)%)
SS □ Steep **((20-30)-(<45-65)%)**
vs = Very steep **(>45-65%)**
SL □ Sloping

% **Slope—give** numerical slope percent.

Aspect--give direction which dominant slope faces, i.e. NW, SE etc.

Drainage

VP = Very poorly drained
P = Poorly drained
SP = Somewhat poorly drained
MW = Moderately well drained

W = Well drained
SX = Somewhat excessively drained
EX = Excessively drained

Vegetation

CF = Cultivated field
HA = Hay
PA = Pasture
WE = Weeds
GR = Grasses
GS = Grasses + shrubs
PK = Park (trees + grasses)
FO = Forest
PL = Plowed

Collectora-List last names only.

Date—Give date profile was sampled.

Parent materials-List sequentially from the surface down as it appears in the soil profile. Use up to three parent materials when applicable.

AL = Alluvium
co = Colluvium
IO = Illinoian outwash
WO = Wisconsinan outwash
BD = Beach deposit
LA = Lacustrine
IL = lllinoian lacustrine
WL = Wisconsinan lacustrine
ES = Eolian sand
LO = Loess
LW = Wisconsinan loess
LI = Illinoian loess
IT = Illinoian till
WT = Wisconsian till
OD = Organic deposit
SA = Sandstone
SI = Siltstone
SH = Shale
LM = Limestone
AI = Sandstone + siltstone
AH = Sandstone + shale
AS = Sandstone + siltstone + shale
AM ❑ Sandstone + limestone
HI = Shale + siltstone
HM = Shale + limestone
CE = Coprogenous
CN ❑ Conglomerate
MA = Marl

Site-County (2 letter abbreviation) - Soil Survey profile number.

Note-Any particular notation about the profile.

HORIZON INFORMATION

Horizon—Give standard horizon nomenclature.

Depth-Give upper and lower depths of horizons in cm.

Boundary-list distinctness (A = Abrupt, C = Clear, G = Gradual, D = Distinct) <u>and</u> topography (S = Smooth, W = Wavy, I = Irregular, B = Broken).

Dominant color-Give moist colors by Munsell notation (Hue, Value, and Chroma) and crushed moist color for Ap, etc.

Mottles (if more than two mottles are present use surface and matrix elements).

Moist Color
Abundanced (A) F = Few; <2%, C = Common: 2.20%, M = Many: >20%
Size (S) 1 ❑ Fine: <5mm, 2 = Medium: 5-15mm 3 = Coarse: >15mm
Contrast(C) F = Faint, D = Distinct, P = Prominent

Texture

Location **(Loc)**

PE = Ped faces
HP = Horizontal ped faces
VP = Vertical ped faces
MA = Matrix
PO = Pores
CV = Clevages
SU = Subcutaneous
CH = Channels
GR = Grains
PP = Peds + pores
RO = Rock fragments

Amount (A)

VF = Very few
F = Few
c = Common
M = Many

Cutans

VFF = Very few faint
VFD = Very few distinct
VFP = Very few prominent
FF = Few faint
FD = Few distinct
FD = Few prominent
TC = Thin continuous
TP = Thin patchy
TV = Thin very patchy
MC = Medium continuous
MP = Medium patchy
CF = Common faint
CD = Common distinct
CP = Common prominent
MF = Many faint
MD = Many distinct
MPR = Many prominent
MV = Medium very patchy
THC = Thick continuous
THP = Thick patchy
THV = Thick very patchy

Color-moist Munsell designation.

Roots

Abundance (F = Few: <l/unit area, C = Common: 1-5/unit area, M = Many: >5/unit area
Size (VF = Very fine: <1mm, F = Fine: 1-2mm, M = Medium: 2-5mm, C = Coarse: >5mm.

Publications Available

A. Laboratory Date Processing and Storage:

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2) Smeck, N. E., L. D. Norton, G. F. Hall, and J. M. Bigham. 1980. Computerized processing and storing of soil descriptions and characterization data. Soil Sci. Soc. Amer. Jour. 44:649-652.

B. **Digitizing Maps and Generation of Interpretative Maps**

Iowa

1) Jansen, I. J. and T. E. Fenton. 1978. Computer processing of soil survey information. Jour. of Soil and Water Conservation 33:188-190.

2) Fenton, T. E., G. A. Miller, P. E. Rosenberry, and J. D. Highland. 1980. Model development and evaluation of interpretative data maps for local land use planning. The Institute of Urban and Regional Research. The Univ. of Iowa, Iowa City, Iowa.

3) Anderson, P. F. and G. H. Beavers. 1976. Reconnaissance Level Identification of Potential Natural Resource Critical Areas. Land Use Analysis Laboratory. Iowa State University, Ames, Iowa.

4) Anderson, P. F. 1978. Land Use and Natural Resource Information Services for Community Development - Ottumwa, Iowa. Land Use analysis Laboratory. Iowa State Univ., Ames, Iowa.

5) Beavers, G. H. 1978. Research Considerations - A Spatial Reference System. Land Use Analysis Laboratory. Iowa State Univ., Ames, Iowa.

Michigan

1) Tilmann, S. E. and D. L. Mokma. 1980. Description of a user-oriented geographic information system: The resource analysis program. Machine Processing of Remotely Sensed Data Symposium.

Missouri

1) Allgood, F. P. 1981. Dekalb County, Missouri Soil Interpretative Maps. Soil Conservation Service State Office, Columbia, Mo.

2) Using Soil Surveys through Interpretive Maps. 1980. Soil Conservation Service, Geographic Resources Center and the Dept. of Agronomy, Univ. of Missouri-Columbia, and Soil and Water Conservation Program, Dept. of Natural Resources. Columbia, Mo.

Ohio

1) Ondecko, J. D. 1977. Procedures and Software of the Ohio Capability Analysis Program. Ohio Dept. of Natural Resources, Columbus, Ohio.

2) Wenner, K. A., G. F. Hall, J. Ondecko, and G. M. Schaal. 1982. Computer Assisted Agricultural Land Assessment. Jour. of Soil and Water Conservation. (in press).

March 8, 1983

Please insert this in the Appendix of your copy of the Proceedings of the North Central Regional Technical 'Work-Planning Conference of the National Cooperative Soil Survey Fargo, North Dakota, May 3-7, 1982. You should have received this Proceedings within the past month.

Use of Soil Survey Information for Land Valuation In the North Central Region

D. D. Patterson

Introduction

Soil maps have been used as a basis for valuing land in the North Central Region for about 50 years. The methodology used to interpret soil maps for land valuation has changed during this period as have the criteria for making soil surveys. At present, the soil map is recognized as a valid basis for land valuation by county and state officials responsible for equalizing land values among ownership tracts and among counties.

National emphasis on a progressive soil survey program about 30 years ago led to more timely completion of county surveys. A more recent development is the accelerated survey program under which county surveys are completed and published (often with state and/or local financial assistance) within a relatively short period of time. The adoption of Soil Taxonomy provided a basis for more precise definition of taxonomic units and for the design of mapping units which facilitate interpretation for a variety of land uses. At present, over 90 percent of the state legislative bodies in this country have enacted use-value laws which provide for the valuation of land according to its current use rather than according to its "highest and best use" as dictated by the land market. Use-value legislation has been applied to farmland, range land and forest land. Historically, land taxes have comprised a small portion of farm production costs. In recent years, however, fanners have been forced to become more cost-conscious and efficient to remain in business. Also they have become disenchanted with the arbitrary nature of the land valuation and assessment process. All of these items have contributed to the increased use of soil maps as a valuation base.

Current Status and Methodology

Within the North Central Region, soil survey information is used as a basis for land valuation in a variety of ways. A review of literature and a questionnaire survey of knowledgeable individuals from the 12 state area revealed the following:

1. Soil survey information is used, in various ways, as the basis for land valuation in 11 of the 12 states. In some states, statutes require that soil survey information, if available, be used for land valuation and establish criteria for its use. Other states have similar requirements for its use but rely on soil scientists , economists and others to provide appropriate guidelines.

2. Land values in sane states are based on the "gross productivity" of one or more crops including pasture, range and/or forest. Productivity ratings (indexes) or monetary values are developed for each taxonomic unit, mapping unit or for groups of units with similar yield potential. The ratings or dollar values are weighted by the acreages of the mapping units in each ownership tract and a composite rating or value is computed for the tract.

3. Several states use "net productivity" **(soil potential)** or estimated gross income from crops minus estimated production costs. Net incomes for the various crops are computed for each taxonomic unit and weighted by the proportions of each crop generally grown on that soil. Thus, an initial esti-

mate of net income is developed for each taxonomic unit and subsequently for each mapping unit. The initial values are expressed as relative ratings or converted to monetary values by use of a capitalization rate. As in Item 2, the ratings or dollar values and the mapping unit acreages are used to develop composite figures for ownership tracts. Local officials often compare the composite figures with sales data and/or capitalized cash rents.

4. In some states, the USDA-SCS land capability classification system is used, to some degree, in the valuation procedure.

5. In general, lend owners in the region feel that any procedure based on a soil inventory and geared to the use-value concept should provide a more equitable basis for assessing rural real estate.

6. Statutory regulations generally favor the use of soil survey information in valuing land for assessment purposes in the region. Soil scientists, however, have not always been consulted by state officials prior to developing valuation procedures based on soil maps and interpretations. Retention of township governments and the lack of a local or county official with the legal authority to implement a program for the valuation and assessment of agricultural land tends to impede progress in some states.

Equitable assessment requires the equalization of land values at three separate levels-among tracts with townships or districts, among townships within counties and among counties within states. Ideally the equalization process begins with the ownership tract and proceeds to township , county and state levels. More often, however, equalization cannot be achieved in this manner because adequate soil surveys are not available for every county or are not used for land valuation in some counties.

At least three states in the region have developed a method for using soil survey information for equalization among counties. In two states the Conservation Needs Inventory (2 percent sample) is used to estimate the acreage of each soil in each county. The acreage figures and soil productivity indexes are used to develop weighted county averages which facilitate the alignment of counties for within state equalization. In 1969 county and township ratings based on general soil maps (scale = 1:125,000) and yield estimates for spring wheat and native grass were developed by experiment station personnel in one state. These data have been used mainly as guides for equalization among townships. Since 1981 crop production and commodity price data collected and compiled by the Crop and Livestock Reporting Service end capitalization rates have been used in that state to estimate the total agricultural land value of each county. In this approach soil quality affects the county values to the extent that it is reflected in the county average crop yields. The county data are based on a 5-year moving average and are updated each year. Possibly data from the Land Resource Inventory recently conducted by USDA-SCS personnel will have sane application in intercounty equalization.

Trends in the Valuation Process

Statutes governing the valuation and assessment of farmland in the region are constantly changing. The adoption of use-value laws by a number of state legislative bodies within the last 10 years is a prime example. Inflated land values and a relatively low rate of return to land during this period have resulted in less reliance on market value and a trend toward the use of sane measure of "productivity" in the valuation process.

The trend in the use of soil survey information for land valuation is toward the net productivity or soil potential concept. Gross production (bushels of grain or animal unit days of grazing) varies greatly among soils while production costs are relatively uniform for the same group of soils. Hence the use of ratings based on relative gross productivity as indicators of value tends to align the various taxonomic or mapping units in the proper numerical order but within a narrow range. Ratings based on net productivity, however, place the soil units in the correct order according to net earning capacity. The result is a more realistic array which is compatible with the use-value concept. The latter approach, however, requires more quantitative data on crop yields, production costs and soil management systems.

Many states have initiated a training or certification program as a means of upgrading the qualifications of local people responsible for the valuation and assessment process. Training programs sponsored by state tax departments or departments of revenue often feature presentations by soil scientists on the use and limitations of soil maps in the valuation process. Field tours led by soil scientists have been used successfully in some states to familiarize local officials with field survey methods and soil-landscape relationships.

Future Needs for Soil Survey Information in Land Valuation

Soil scientists can expect more demand for their products-soil maps and interpretations-in the future. Our present involvement is the result of public need and public awareness of the usefulness of soil survey information in the valuation process. Considering the emphasis on the use-value concept and the trend away from the market value standard by state legislative bodies, one must assume that the emphasis on "productivity" will continue.

If the anticipated demand for soil survey information in this area does materialize, we must be prepared to provide more quantitative information. Research in the area of soil-plant-climate-management interaction will be needed if valid yield estimates are to be developed. Data on commodity prices and production costs must be current and realistic if they are to be part of the procedure. Our information must be based more on fact and less on assumption. We must produce quality soil maps which show the soil-landscape differences (particularly surface features) which are readily apparent to land owners and assessors. Probably the best test of the quality of a soil survey lies in the reaction of the public when that survey is used as the basis for valuing land for assessment purposes.

Limitations of Soil Survey Information in the Valuation Process

State and local officials sometimes regard soil survey information as the solution to their valuation and assessment problems. Soil survey information, however, must be regarded only as the first step in the valuation process.9

1/ The role of the soil scientist in the land valuation and assessment process requires clarification. Soil scientists provide physical data - soil maps, crop yield estimates and information on soil management systems and cropping patterns. Economists, often with the help of soil scientists, contribute estimates of commodity prices, production costs and capitalization rates needed to convert the physical data into a first approximation of monetary value. Local officials responsible for property assessment generally make further adjustments for physical and/or economic factors which may be unique for a particular tract of land. Finally, assessed values for tax purposes are established by local officials.

Soil maps show the extent and distribution of the soils on a particular tract but they are not designed to show many of the items which must be considered in the valuation process. Any adjustments required for hazards and/or location for a particular tract must be made by local officials.

The scale of mapping governs the usefulness of a soil survey for a particular purpose. Reconnaissance soil maps and data derived from a small statistical sample are suitable for land valuation at state and county levels but at township and tract levels more detailed information is required. We must attempt to prevent the use of our maps and interpretations for purposes for which they were not designed.

Soil maps and interpretations cannot provide the whole solution to state and local valuation, assessment and equalization problems but they do provide a valid beginning. In our negotiations with state and local officials for funding to support the soil survey, we must emphasize the value of our information but we must not oversell it.

summary

The current status of soil survey information as a basis for land valuation in the North Central Region has been discussed briefly. Evidence has been presented which indicates public acceptance of soil survey information for this purpose. The demand for soil maps and interpretive data seems certain to increase. In the future, soil scientists must be prepared to provide quality soil maps and more quantitative interpretations. We must remember that our inforamtion is the basis for only the initial step in the valuation process. Also we must be mindful of its limitations for a given use. Our role in the valuation process is to provide the most valid information which the "state of the art" allows and to be willing to have our products and services judged by the public on merit.

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NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

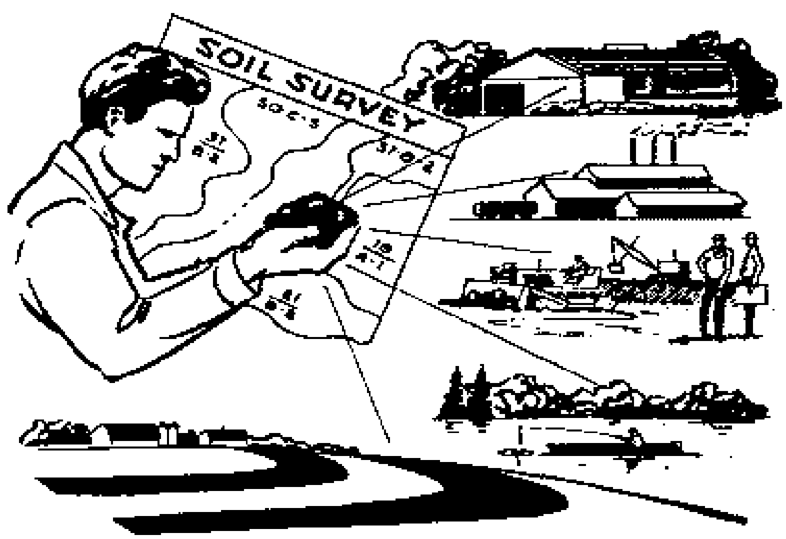
Lafayette, Indiana
May 19-23, 1980

PROCEEDINGS OF

NORTH CENTRAL REGIONAL

TECHNICAL WORK-PLANNING CONFERENCE
OF THE
NATIONAL COOPERATIVE SOIL SURVEY

LAFAYETTE, INDIANA
MAY **19-23, 1980**



U.S. DEPARTMENT OF **AGRICULTURE**
SOIL CONSERVATION SERVICE

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NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
Lafayette, Indiana
May 19-23, 1980

A G E N D A

May 19, 1980

Monday - PM

12:45 - 1:15	Welcome	Buell M. Ferguson State Conservationist
1:15 - 3:00	Meetings of Committees 1 and 4. - Improving soil survey techniques and modernizing soil surveys. - Soil potentials.	
3:00 - 3:15	Break	
3:15 - 5:00	Continue meetings of Committees 1 and 4.	

May 20, 1980

Tuesday - AM

7:45 - 9:15	Meetings of Committees 3 and 7. - Soil-water relations, including water movement in soil landscapes. - Using soil as a medium for treating wastes.
9:15 - 9:45	Recycling Sewage Sludge on Cropland - Dr. Darrell Nelson
9:45 - 10:00	Break
10:00 - 11:30	Continue meetings of Committees 3 and 7.

Tuesday - PM

12:30 - 2:00	Meetings of Committees 6 and 8. - Soil correlation and classification (including forest soil classifications) - Classifications, interpretations, and modification of soils on mine spoils and disturbed soils.
2:00 - 2:30	Soils and alternative designs for on-site waste disposal - Dr. Joe Yahner
2:30 - 2:45	Break
2:45 - 4:45	Continue meetings of Committees 6 and 8.

May 21, 1980

Wednesday - AM

7:45 - 11:30	Separate meetings of participants from land-grant colleges (NCR-3) and participants from SCS.

12:30 - 1:00	Soil Survey - Victor G. Link
1:00 - 2:30	Meetings of Committees 2 and 5. - Soil interpretations, - Educational activities for soil resources and land use.
2:30 - 2:45	Break
2:45 - 4:45	Continue meetings of Committees 2 and 5.
5:00 - 8:00	Banquet and a visit to "WOLF PARK".

May 22, 1980

Thursday - AM 8:00 - 9:00	Alcohol from Biomass - what does it do to the soil? - Dr. Otto Doering
9:00 - 12:00	Committee Reports
Thursday - PM 1:30 - 4:30	Tour LARS - Dr. Richard Weismiller Use of remotely sensed data in soil survey (OPTIONAL)

May 23, 1980

Friday - AM 7:00 - 12:00	Using remotely sensed data in making the Soil Survey of Jasper County, Indiana. Travel to Jasper County to see the soil scientists using remotely sensed data to make a soil survey. You can review the soil maps made the past mapping seasons and evaluate the soil survey descriptive legend developed using remotely sensed data. (OPTIONAL)

PARTICIPANTS IN THE 1980
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

John D. Alexander
Ferris P. Allgood
Frank L. Anderson
James L. Anderson
Marion F. Baumgardner
O. W. Bidwell
John I. Brubacher
Edward L. Bruns
Richard L. Christman
James R. Culver
Leon B. Davis
T. E. Fenton
Charles S. Fisher
Don Franzmeier
Erling E. Gamble
George F. Hall
Kenneth C. Hinkley
Phil Harlan
K. K. Huffman
Ivan Jansen
Paul R. Johnson
Ronald J. Kuehl
Mark S. Kuzila
Gilbert R. Landtiser
Jerry D. Larson
Gerhard B. Lee
James H. Lee
Gary D. Lemme
Dave Lewis
Victor G. Link
Dale Lockridge
Donald Rex Mapes
Maurice J. Mausbach
Steve Messenger
Gerald A. Miller
Paul E. Minor
Delbert L. Mokma
Gary B. Muckel
Darrell W. Nelson
John R. Nixon
Hollis W. Omodt
Donald D. Patterson
Robert Pope

PARTICIPATNS IN THE 1980
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

Alexander (Bob) Ritchie

William E. Roth

Walter E. Russell

Richard H. Rust

Stephan G. Shetron

H. Raymond Sinclair, Jr.

Miles W. Smalley

Neil E. Smeck

Mike Stout

Michael Thompson

Bruce W. Thompson

E. A. Tompkins

Larry A. Tornes

David G. VanHouten

Kenneth D. Vogt

Earl E. Voss

Glenn A. Weesies

Richard A. Weismiller

Joseph E. Yahner

Ted Zobeck

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING
CONFERENCE COMMITTEE ASSIGNMENTS
MAY 23, 1980

Committee 1 - Improving soil survey techniques and modernizing soil surveys

Chairman - Gilbert L. Landtiser
Vice Chairman - Burt W. Ray

Frank L. Anderson
Steve R. Base
Marion F. Baumgardner
Louie L. Buller
James R. Culver
Sylvester C. Ekart
Charles S. Fisher
Rodney F. Harner
Mark S. Kuzila
William E. Roth
Robert F. Springer
Richard A. Weismiller

Committee 2 - Soil interpretations

Chairman - Kenneth C. Hinkley
Vice-Chairman - Laurence E. Brown

Marvin L. Dixon
Paul R. Johnson
Jerry Larson
James H. Lee
David T. Lewis
John R. Nixon
Hollis W. Omodt
Alexander Ritchie
Sam J. Ross, Jr.
Walter E. Russell
James H. Thiele
Joseph E. Yahner
Don Yost
Larry D. Zavesky

Committee 3 - Soil-water relations, including water movement in soil landscapes

Chairman - Richard H. Rust
Vice-Chairman - Erling E. Gamble

Otto W. Baumer
Richard L. Christman
K. R. Everett
Don P. Franzmeier
Francis D. Hole
Eugene J. Pope
Wiley Scott
C. L. Scrivner
Thomas J. Thiel
John R. Worster

Committee 4 - Soil potential

Chairman - John T. Brubacher
Vice-Chairman - Leon B. Davis

Wells F. Andrews
James A. Brockheim
James A. Bowles
Paul E. Minor
Delbert L. Mokma
Miles W. Smalley
Neil E. Smeck
Edward Tompkins
Lawrence A. Tornes

Committee 5 - Educational activities for soil resources and land use

Chairman - Gerald A. Miller
Vice-Chairman - Robert A. Pope

Albert Beaver
Orville W. Bidwell
Raymond T. Diedrick
Lowell Hanson
Milo Harpstead
Chris J. Johannsen
Gary D. Lemme
L. Dale Lockridge
Douglas D. Malo
Steve Messenger
Gary C. Steinhardt

Committee 6 - Soil correlations and classifications (including forest soil classifications)

Chairman - John D. Alexander
Vice-Chairman - George W. Hudelson

Lindo J. Bartelli
Eric Bourdo
Edward L. Bruns
T. E. Fenton
Ronald J. Kuehl
Gary B. Muckel
Roy M. Smith
Neil Stroesenteuther
Robert I. Turner
David

North Central Regional Technical Work-Planning Conference

LaFayette Indiana
May 19-23, 1980

Minutes

The 1980 Biennial meeting of the North Central Regional Work-Planning Conference was called to order by Chairman Sinclair at 12:50 PM, May 19.

The Chair introduced Mr. Buell M. Ferguson, State Conservationist for the Soil Conservation Service who welcomed the Conference to Indiana and briefly discussed the Soil Survey Program in the state.

Minutes of the January 30-February 3, 1978 meeting in Madison, Wisconsin were approved.

The Chair appointed a nominating committee for the purpose of nominating a secretary for the 1982 meeting in North Dakota and to also select a site for the 1984 North Central Regional Work-Planning Conference. James Lee, Missouri was named chairman of the nominating committee. The conference recessed for committee meetings at 1:15 PM.

The conference met in general session again at 9:15 AM on May 20, 1980 to hear Dr. Darrell Nelson discuss his research on "Recycling Sludge on Crop Land". Some of the major considerations included rate of application, presence and absence of heavy metals and effects on soils. Conference resessed at 9:45 for committee meetings.

The conference reconvened at 2:00 PM, May 20, 1980 for a talk by Dr. Joe Yahner on "Soils and Alternative Designs for On-Site Waste Disposal". Slides illustrated actual problems in the field resulting from soil properties, size of disposal field and improper design for the kind of soil as well as successful well-planned disposal systems. Conference recessed again for committee meetings 2:30 PM and for separate meetings of participants from land-grant colleges and participants from SCS Wednesday morning, May 21.

The conference met again at 12:30 PM, May 21 to hear Mr. Victor G. Link of the SCS Washington office discuss current information regarding soil survey. Recessed at 1:00 PM for committee meetings.

The conference met at 8:00 AM, May 22 to hear Dr. Otto Doering, Agricultural Economist speak on "Alcohol from Bio-Mass- What does it do to the Soil?" Dr. Doering discussed sources of material for the production of alcohol and the effects the use of such large amounts of organic materials could have on the soil. He stated it would require 10 billion gallons of alcohol to convert 100 billion gallons of gasoline to gasohol. Presently the U.S. is producing 80 million gallons. To produce the 10 billion gallons would require 60% of all corn produced in the US each year.

Committee 1. Improving Soil Survey Techniques and Modernizing Soil Surveys. Gil Landtiser, Chairman.

Planning and meeting future needs for soil survey is altered by the shift from a date certain for completion of the survey of the nation to a system based on priorities of highest need and the interest of the potential users.

Training needs related to field operations are strongly emphasized, especially management training for soil scientists related to their present and future activities.

Ways to update and revise older "sable soil maps can in many instances be accomplished by "se of Soils-5 to update tables and interpretations. If recorrelation is necessary maps could be transferred to new imagery with recompilation.

Recommend committee be continued

Question: Will management training be available to soil scientists? Much needed.

Stout: Training at different levels will be available to soil scientists.

Moved and seconded the report be accepted (Voss. Bruns). Motion carried.

Committee 2 - Soil Interpretations. Kenneth C. Hinkley, Chairman.

The relationship of soil moisture regime - soil water table depth includes two distinctly different situations. These are soils wetted from the surface downward and those wetted by upward movement of water. Water tables and drainage classes cause the most concern. These are problems which are not differentiated in Taxonomy and must be handled in the map unit description.

Committee feels quantified criteria are necessary for land capability classification. National memo 30-O-9 pertains to revision of capability class standards.

Those with concerns about water problems in forested areas should get comments to TSC or Washington. How should they be mapped? Soils are wet until trees leaf out and use soil moisture. During this period forest soils are wet even though well drained. Trafficability is limited.

Recommend committee be retained.

Lee: Why not "se drainage classes?

stout: Drainage classes "se saturation. Request the forest survey users use a format for providing information on this problem.

Moved and seconded report be adopted. (Fenton-Rust) Carried.

Committee 3. Soil Water Relations, including movement in soil landscapes. R. H. Rust, Chairman.

No information available on water movement in frozen soils. Observations of fragipans indicate some include and others do not include fragipans in estimating available water capacity.

Research at Purdue indicates 1/3 bar is not a good measure of water content while the 15 bar value is reliable for wilting point. It indicates field capacity should be measured in the field. Plant available water should be related or rated on landscape position.

Recommend committee be retained.

Moved and seconded report be adopted (Rust-Fenton). Carried.

Rust: Note that water tables, soil moisture, etc. was a topic of several committees.

Committee 4. Soil Potentials, John I. Brubacher, Chairman.

Committee chose one land use as a basis for developing the kind of data needed and the source of data to defermine soil potential. A form was developed. To use the form select the land use, factors affecting use and data sources. Enter the data sources on the form.

Recommend report be accepted.

Moved and seconded the report be accepted (Hall-Smalley). Carried.

Committee 5. Educational Activities for Soil Resources and Land Use. Gerald A. Miller, Chairman.

Committee charges were model soil survey educational program about use of soil surveys, teaching effectiveness of large versus small sized groups, ways to provide additional emphasis on interpretation in undergraduate courses, applicability of SCS correspondence course on soil surveys, and their uses, feasibility of developing a correspondence course on soil taxonomy, correspondence course on soil interpretations and alternative courses of action for a regional travel soils course. All but the latter were addressed by the committee.

Rust: If correspondence course in interpretations is developed what are chances it would be available?

Mausbach: I believe something is being worked on.

Moved and seconded the report be accepted (Miller-Rust). Motion carried.

Committee 6. Soil Correlation and Classification. John D. Alexander, Chairman,

Most of the work of the committee centered on the first two charges - "soil drainage class" as used in various areas of region and soil correlation problems.

Most were using soil drainage essentially as in USDA Handbook No. 18. General agreement that in dealing with soil drainage classes we are dealing with water tables.

Discussion on soil correlation centered on mapping of eroded units, use of taxadjuncts especially as we gain additional data, not all soils in the same family are treated the same or have the same interpretation, lack of adequate data for all interpretations and the classification of eroded Mollisols as Mollisols in order to emphasize genesis.

Question: How safe is the calssification or mapping of eroded Mollisols as mollisols?

stout: Not sure how safe eroded Mollisols are.

Moved and seconded the report be accepted (Fenton-Voss). Carried.

Committee 7. Using soil as a medium for treating waste. George Hall, Chairman.

Committee charges were to test degree of limitations by application of criteria, develop soil potential ratings as a medium for treatment of waste products and review any research under way for the use of soil as a treatment medium for waste products.

The committee developed a list of physical, chemical, site, and other properties to be considered in rating soils as a medium for waste treatment. These points emphasized that surface soil must have adequate infiltration, the subsoil or B horizon must have adequate permeability and the slope should be less than 6 percent.

Suggested copy of handbook for waste disposal be attached to committee report. The typesofwaste disposal include septic, manure, and toxic materials. A question exists as to whether we should consider waste utilization or disposal - much waste has value and is of use in soil and utilization is a positive rather than negative term.

Recommend committee be continued.

Bruns: Can put additional information on Soils form 5 for waste disposal or utilization. Moved and seconded report be accepted (Fenton-Brubacher). Carried.

Committee 8. Classification, interpretation and modification of soils on mine spoils and disturbed soils. Earl E. Voss, Chairman.

Committee is sure reclaimed land can be classified and recommends committee be continued. The committee should retain its present charge with development of K factor for reclaimed land, study of compaction problems and essential additional charges for consideration.

Moved and seconded report be accepted. (Fenton-Mausbach) Carried.

Jim Lee, Chairman of nominations committee reported Kansas had invited the North Central Workshop to hold its 1984 meeting in Kansas. Lee moved, Smalley seconded, we accept Kansas invitation. Motion carried.

Lee moved William E. Roth be elected secretary of the 1982 workshop. Seconded and carried.

Stout commented this session had been very good with the best discussion at committee meetings of any workshop for a number of years. He felt the balance between items of importance to us and of importance to soil science was good.

Fenton suggested that soil moisture be concentrated in one committee when charges are given to the various committees.

H.W. Omodt
Secretary

Summaries of remarks made to the participants by the following people:

Buell M. Ferguson, State Conservationist, SCS, Indianapolis, Indiana. Welcome to Indiana. I am pleased to take part in this conference of the North Central Regional Technical Work-Planning Conference of the National Cooperative Soil Survey. This cooperative program is carried on by the Soil Conservation Service and other federal agencies, land-grant universities, and other state and local agencies.

In addition to the regular soil survey activities that are being carried on with too few people and too little money, there are three additional large jobs that face us:

(1) The first is to coordinate soil map units that qualify as prime farmland. There is great interest in prime farmland especially in areas of surface mining for coal.

(2) The second is the revision of the Soil Survey Manual. Much has been learned since 1951. The approach taken in allowing the field soil scientists to use it in the field before publication is excellent.

(3) The third is the development of soil potentials. This is a tool that users of soil surveys have been waiting for a long time.

Each one of these tasks is a difficult job by itself.

Later in the week there will be a field trip to show how remotely sensed data is assisting in soil mapping in Jasper County. We in Indiana believe this is a tool that greatly enhances the quality and quantity of a soil survey. I invite you to look critically at our endeavor and ask questions when you are with the Party Leader. He is the one that can best evaluate its usefulness.

We, also, are using remotely sensed data to locate critically eroding areas. This technique is still in the testing stage but shows a great deal of promise.

The topics to be addressed in the different committees are appropriate to todays problems and opportunities. During your discussions, I ask you to always keep in mind soil surveys are for land use decision makers. These people need the best up-to-date information available.

I know you are anxious to get started with your committee work so I will let you proceed. Have an enjoyable stay in Indiana.

Dr. Darrell Nelson, Department of Agronomy, Purdue University. Recycling Sewage Sludge on Cropland. Application of municipal sludge to cropland is rapidly becoming the preferred method for disposal by many U.S. cities. The discussion included information on sludge characteristics, considerations for selection of sludge application sites, current regulations and guidelines on land application of sludges, and techniques for planning application programs.

Dr. Joe Yahner, Department of Agronomy, Purdue University. Soils and Alternative Designs for On-Site Waste Disposal. Considerable interest has developed in recent years concerning alternative designs for on-site waste disposal. Selection of the proper system design is closely related to soil properties and site characteristics. Indiana is now beginning a research and demonstration program aimed at improvement of this technology over the state.

Dr. Otto Doering, Department of Agricultural Economics, Purdue University. Alcohol from Biomass--What Does It Do to the Soil? Dr. Doering discussed local production of liquid fuels and explained why there might never again be a straight row of corn planted in the Midwest. He discussed consideration of cellulose conversion to alcohol and how the removal of corn stalks from the land may *affect the soils.*

MINUTES

NCR-3 May 21, 1980

Ramada Inn - Lafayette, Indiana

7:45 am - 11:30 am

NCR MEMBERS PRESENT:	*Dave Lewis	University of Nebraska
	Gerald Miller	Iowa State University
	Michael Thompson	Iowa State University
	Jim Anderson	University of Minnesota
	Ivan Jansen	University of Illinois
	*Tom Fenton	Iowa State University
	*Gerhard B. Lee	University of Wisconsin-Madison
	John Alexander	University of Illinois
	Bob Pope	University of Illinois
	Phil Harlan	University of Nebraska
	*Charles R. Krueger (Adm. Advisor)	Ohio Agr. Research & Development Center, Wooster
	Mark Kuzila	University of Nebraska, Cons. & Survey Div.
	Gary D. Lemme	Michigan State University
	Ray Bryant	Purdue University
	*Hollis W. Omodt	North Dakota State
	*Don Franzmeier	Purdue University
	*Dick Rust	Minnesota
	Dick Johnson	SCS, Lincoln, NE
	Stephen Shetron	Michigan Tech University
	George Hall	Ohio State University
	*Neil Smeck	Ohio State University
	Ted Zobeck	Ohio State University
	Richard Christman	Ohio Dept. of Natural Resources
	Donald Patterson	North Dakota State University
	*Orvill Bidwell	Kansas State University
	*Del Mokma	Michigan State University
	Steve Messenger	No. Illinois University

*denotes official committee members

Meeting called to order at 7:50 am by Chairman, Del Mokma.

Bob Pope was asked to represent our group at the meeting of Federal representatives of NCR-3. which convened at the same time.

A. Comments by Dr. Charles Krueger, Administrative Advisor:

1. The NCR-3 proposal to carry the projects through September 30, 1983 was approved by the directors in March, 1980. Notice of this had been sent to members earlier.

2. The Federal budget is in a state of flux, and the outcome is unknown for the fiscal year of 1981. An increase of 4-10% (maybe) is possible but the directors are using an increase of 4-62 for their planning purposes. Dr. Krueger felt the reorganization of Experiment Station activities will no doubt continue to take place.

B. Old Business:

1. Minutes of the last meeting, October 17-18, 1979 at Lincoln, were approved as written.

2. A nominating committee of N. Smeck, D. Franzmeier, and T. Fenton was established to nominate an incoming secretary, an individual to represent NCR-3 at the National Soil Survey Work Planning Conference, and 2 individuals to serve on the regional and national committee on Soil Taxonomy.

   D. Franzmeier, on the committee on Soil Taxonomy, will be replaced this year. Members are elected for 3 year periods. During their last year they serve as the representative of the region on the national committee for Soil Taxonomy.

3. Discussion of Don Franzmeier's calculations of the amount of organic carbon in the top meter of soils.

   Don indicated that concern for the amount of CO_2 in the atmosphere from the oxidation of soil organic matter was one of the things creating interest in this topic. Individual states discussed results of calculations that they had made.

   a. Indiana had found 4 kg/ha in the soils on Illinoian till plain and 10-11 kg/ha in soils on the Wisconsin till plain.

   b. Michigan found 23-46 kg/ha, but they felt this was biased upward because of the large number of organic soils in the region.

   c. Iowa found a lower limit of 5 kg/ha and an upper limit of 24 kg/ha.

   d. Results of North Dakota are indicated on the attached sheet labeled North Dakota pedon data and estimated organic carbon content of soil association NCR-3

   These were the only states indicating that calculations had been made at this time.

   D. Franzmeier suggested that the committee put together a map and table showing kg/ha organic matter in the top meter throughout the region and put this information into publication.

Comments: A discussion ensued regarding the suitability of the old (1950's) rap as above for this publication. All things considered it was decided that this map would probably be suitable, although many shortcomings are evident. It was decided that a small scale map be constructed, not using the old names, but using the boundaries or some that approximate existing ones. This would be prepared by D. Franzmeier and submitted, subject to approval by various states. Associations would be assigned to states for calculations.

0. Bidwell moved that we move ahead on this project. G. Lee seconded the motion.

e. T. Fenton spoke in favor of the project, but suggested that it be done using similar map units. For example, a typical Marshall soil compared to all the eroded map units would have different values. The results would depend on which you use for the base data.

f. D. Rust also spoke in favor of the motion. It was unanimously approved.

It was suggested that the fall *meeting* of NCR-109 be the deadline for providing D. Frazmeier with information on associations assigned to the various states. Don will then begin to compile the information and put it on a map as agreed.

4. Revision of the Regional Soil Map and NCR-76 Bulletin:

A task force consisting of T. Fenton, D. Lewis, J. Killer, D. Franzmeier and N. Smeck, with T. Fenton as Chairman, agreed at the fall meeting of 1979, to begin the consideration of creation of a new regional soil map. It was pointed out that several states are working on a 1 to 500,000 scale soil association map, and a lot of information is available from work by individual states. G. Lee moved that the task force consider the feasibility of three approaches to the regional map:

a. A compilation of all available state maps to be put together in a packet and used as a regional publication.

b. A creation of a new map of the region.

c. A summary map of state soil maps.

The task force will consider these three alternatives and report to NCR-3 at their next meeting.

5. Results of the Inter Soil Testing Lab Study:

Results of this study were completed over a year ago but no formal publication had been made of them. It was suggested by N. Smeck that the region put together a publication on this topic. 0. Bidwell suggested that this be submitted to the Soil Science Society of America Journal as a Note. G. Hall, an associate editor of the Journal, said that he thought this would be appropriate. D. Rust will take leadership in preparing a Note on this topic.

6. Dr. Orville Bidwell is Chairman of a committee to draft a letter to former members thanking them for their efforts in the work carried on by NCR-3.

Dr. Bidwell indicated that he had not done this at this time, but would get his committee together and draft such a letter.

7. The surface Organic Matter Map:

J. Alexander, who had brought this up 2 years ago, felt that the map proposed by D. Franzmeier concerning the amount of organic matter in the top meter, plus the top 20 cm, would meet the needs that the surface organic matter map had been planned to meet.

C. New Business:

1. T. Fenton mentioned the possibility of a project on digitizing soil maps within the region. D. Franzmeier discussed the activities of LARS (to be observed on the field trip Thursday). Several states indicated activities in digitizing soil maps. Common problems were discussed.

2. The incoming secretary will be Dick Rust of Minnesota. This nomination was seconded by D. Lewis and approved unanimously.

3. Representatives to the National Soil Survey Work Planning Conference will be D. Lewis, as incoming Chairman, and N. Smeck. 0. Bidwell seconded the motion and this was approved unanimously.

4. Candidates for regional and national soil taxonomy committees.

   J. Fehrenbacher will serve 1980, 1981, 1982, D. Lewis - 1981, 1982, 1983

   The representatives for the national committee are as follows: 1980 - H. Omodt, 1981 - N. Smeck, 1982 - J. Fehrenbacher, 1983 - D. Lewis.

5. G. Lee brought up the topic of prime/important/unique farmland maps. A discussion followed. There appears to be considerable dissatisfaction with groupings within these maps, but no concrete suggestions for improvements was noted. It is evident that most members feel that decisions on these kinds of things are better left to local or state officials than to federal officials in Washington.

6. Administrative advisor, Krueger, encouraged the group to follow up on the committments the committee has made. He indicated that if a subcommittee must meet, arrangements can be made so that this can be done.

7. Dr. Krueger indicated that he would notify directors regarding upcoming National Soil Survey Work Planning Conference and indicate approved members from NCR-3.

D. Adjourn 11:30 am

Respectfully submitted,

David T Lewis

David T. Lewis
Secretary NCR-3, 1980

Federal Agencies, Separate Session

NORTH CENTRAL REGIONAL WORK-PLANNING CONFERENCE
Lafayette, Indiana
May 19-22, 1980

M. Stout, Chairman

INVENTORY & MONITORING

Wetland soils (Hydric)
Prime farmland coordination
Prime farmland in manuscripts
Impact I&M on soil survey operations

SOIL SURVEY OPERATIONS

Statue Soil Survey Manual
Plans for remapping counties before completing counties
Mileage restrictions and mapping remote areas
Maintain schedules despite increased costs and less manpower
Soil scientist needs where mapping complete
AMS - status and proposed use
Status of word processing systems
Memorandum of understanding - necessary
National and International soil survey plans
Relationship of Forest Service to NCSS
Changes in Soil Taxonomy
- Supplements
- Approval of proposals
- International proposals

New CASPUSS model - handout
Approval of series names

NATIONAL SOIL SURVEY LABORATORY

Soil moisture studies
Pb-Cd studies
Present activities
Long range plan - soil characterization

CORRELATION & INTERPRETATIONS

CORRELATION & INTERPRETATIONS - cont'd

Prime land printout/correlation memo
Woodland coordination system
Windbreak coordination
Preparation of SCS-Soils-5
Preparation of SCS-Soils-6
Dry colors needed for dark-colored soils
Descriptive legend need ahead of time on CFR & PC
Describing soils - tube vs pit

CARTOGRAPHIC

National High Altitude Program

Federal Agencies, Separate Session

NORTH-CENTRAL REGIONAL WORK PLANNING CONFERENCE
Lafayette, Indiana
SCS Meeting, May 21, 1980
M. Stout, Chairman

Action items indicated by asterisk and underlining

Chairman's opening remarks
With regard to scheduling, preliminary telephone conversations with the TSC are desirable. Check CASPUSS.

The TSC has proposed two meetings for next year: (1) state soil scientists and state staff members concerned with correlation and (2) authors workshop.

Sixty-one soil survey reports were published from the Midwest last year.

The TSC reaffirms its desires to assist states in various activities.

The new correlation sample boxes were displayed.

Cartographic
The National High Altitude Program was discussed. A handout was distributed. Mark Hurd has both contracts.

Fisher--
The problem is to get photos at the time (leaf on or off) needed.
Link--
The first contract, 600,000 square miles, looks good.
Huffman--
Do states get the chance to select flying time?
Lee--
Are these photos quad centered?
Link--
Yes, USGS wants to use them.
Link--
Some old contracts will be canceled. These canceled areas will probably determine the priorities for the High Altitude Program.
Hinkley--
We are getting increased costs on old ordered photography.
Landtiser--
ditto
stout--
The TSC has been picking up extra costs. There have been no problems with enlarging to 1 to 20 or 24,000.
Huffman--
If a state cancels a contract, who is to rebid--the same contractor at a higher cost?
Link--
The present funding level is aimed at a S-year cycle. The Soil Conservation Service is requesting help from other agencies to shorten the cycle.

Preparation of custom legends for soil survey
stout--
Everything needed is presented. Keep the legend in order. Do not change definitions. You may delete.

Change of scale
stout--
Change of scale is not recommended. There are dire consequences.
Landtiser--
Iowa is scheduled for 15,840 scale. Are we required to shift to 1 to 20,000?
stout--
NO.

Wetland soils
Muckle--
What is in the future with regard to wetland soils?
stout--
We will map soils including wet ones.
Lee--
What about the list of soils?
stout--
Most have been accepted. Care is needed with defining wetland soils or many corn belt soils will be called wetlands.
Link--
The definition of hydric soils is not settled. This makes listing of wetland soils difficult.
Russell--
The Forest Service is restricted on what they can do in the forest.
stout--
There are hidden impacts in the definitions of wetland soils. There is a national bulletin on policy regarding them.

The "Classification of Wetlands and Deepwater Habitats of the U.S." was presented.

Prime farmland coordination
stout--
With regard to coordination of I&M, Stout and Harner at the TSC are to answer any questions.
Sinclair--
There are contradictions in the document concerning prime versus nonprime land.
Stout--
Many determinations are onsite determinations.
Huffman--
What about coordination with other regions?
stout--
Yes, there should be coordination. The joining states should go the same way.
Lee--
We should use selected criteria in coordinating.
stout--
We have to get together and agree. There is a summarzied computer listing of prime soils.
Ohio asks is "where drained" needed?
Stout--
For court cases it is probably needed. We should list conditions that make a soil prime. Prime maps are not site specific. The trend seems to be towards more general maps. We must refer to the soil survey. Prime maps are required! They are expensive!
Hinkley--
South Dakota is developing a 1 to 100,000 map.

Lee--

Suggests digitizing in the computer to produce prime maps and any other kind of map.

Stout--

We are trying this with part of a county in North Dakota.

Landtiser--

There is not much use or call for prime maps.

Smalley--

Makes the same statement.

Sinclair--

*Requests a check with **Carto** on the cost of Indiana's prime maps. *Ask Cartographic if government printing office is to start printing prime maps.

Prime farmland in manuscripts

stout--

Indication of prime farmland is required in new publications. There is a disclaimer memo relative to the nonagricultural use of prime farmland. *Stout will send out a bulletin. The methodology for getting the prime land indicator on the soils 5 and 6 interpretations tables was discussed. A handout was distributed.

Multiresource inventory

There was a general discussion of the inventory sheet

Benchmark soils

An alphabetical list has been compiled. The state with the ownership generally takes the responsibility and leadership for a particular soil. The acreage was determined from the map unit use file. A few, Houghton, Rockwood, **Parchin,** and Taylor had no acreages. A regional set of benchmark soils will be picked. This will be further reduced to a national set. *Any second thoughts from the states are requested. The new lists and the old lists are quite different. There were very few repeaters. We do not have a representation of the taxonomy spectrum as yet.

Smalley--

How often is the map unit use file sent out in an updated form? We find it to be useful.

Stout--

*We will aim at every 6 months.

CASPUSS

The new publication model was discussed. This is a schedule of publication time for the period after the comprehensive review. Under old scheduling 33 months were required. With the new model, 20 months are required. A memo has been sent out to the state with a copy of the new model. Please use this as a target. We are not suggesting a mass changing of already scheduled time.

With regard to correlations, there are 16 correlations staying in states 9 months or more. It was requested that there be more prompt attention paid to these.

Huffman--

Editing of text is better at the TSC than with the Washington contract editing.

Link--

It is being looked at. There are staff and other problems to surmount.

Stout--

Budget requests for extra Linolex, etc., have been scratched. The TSC will do the editing it can--the rest will go elsewhere. Washington is budgeting by CASPUSS. "States should get their future surveys on Caspuss for budgeting purposes.

Soil survey appraisal 1981

Minnesota, Missouri, Nebraska, and South Dakota will have appraisals. *The TSC requests dates so that these appraisals may be scheduled.

Word processing equipment

There are guidelines for word processing equipment available. Give the R&CC staff at the TSC a call for guidance.

Muckel--

Are there plans for access to data by the states directly for obtaining **5's** and tables?

stout--

There is the possibility.

Memorandum of understanding

This is necessary with universities and so forth.

Mileage restrictions, maintaining schedules, etc.

Huffman--Link--

There is a move to restrict fuel used rather than mileage. This is suppose to encourage the use of high mileage vehicles.

Metric

This has been delayed until October. Nothing more is known. Horizon nomenclature is deferred as well. Conversion will be made eventually.

Soil survey manual

Link--

There are many problems. The manual has to be a separate publication, such as a reference.

Soils staff meeting notes

Stout asks should they be sent out the states? *There was a general feeling that it would be useful. This would be in a newsletter form.

Joining maps

Problems occur when there are parties in adjoining counties--they need to join!

Link--

There will be correlation between states and between MLRA, and joining is going to be policy. This will be required for RCA use.

States working with Forest Service

Ed Bruns asked how was this proceeding?

Stout--

Excellent! The Forest Service has been invited to TSC training programs.

National Soil Survey Laboratory

Soil moisture study
This is being coordinated by the National Office. The laboratory representative is Otto Baumer. The major use to be made of this study is probably for remote sensing in association with the Agristars satellite.

Landtiser--

There is no money for this without robbing the Iowa soil survey.

Link--

1 agree this is bad. No money was requested nationally to perpetuate this project.

stout--

State conservationists need to battle for funds.

Lead--Cadmium
There is to be a review of this project in the immediate future. If there are any problems or suggestions, relay them to George Holmgren, NSSL. Landowners have raised the question about their farming operations being shut down if high cadmium levels are found. Holmgren doesn't feel that this will be a problem because the data will not be published widely. He does not plan to send the data to the states. He plans to send a report. The general feeling of the group was that they would like the data. Cooperating landowners should have the data dealing with their land.

Present activities
Sample load has doubled in the last 3 years. The backlog is now staff's **abilitv** to interpret the data. There is now in **preparation** a guide-on interpreting lab **data** that will be distributed to the states.

Long range plans
The lab requests a S-year plan from the states on proposed investigations, primarily characterizations. A specific work plan won't be required on such studies because it will already be in the S-year plan.

SUMMARY REPORT

for the

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING

CONFERENCE COMMITTEE 1

May 22, 1980

Charges

1. Planning and meeting future needs for soil survey.
2. Training needs related to field operations.
3. Explore ways to revise and update older but still usable soils maps.

Preliminary summary of committee comments suggested for discussion at the conference sessions at Lafayette, Indiana. It has been difficult to narrow down the many comments to what might seem to be the most importnat or at least most consistently expressed by our committee members.

Charge 1

Comments cover a rather broad spectrum ranging from the immediate needs of completing the first round survey for the entire nation and the subsequent follow-up assistance needed to make the surveys available to all users after reaching our first goal.

1. The need for a long range plan - new long term commitment has been changed from the concept of a definite date to one of priorities based on the highest need and readiness of the intended users.
2. A suggestion that the CASPUSS system provides the background of planning for the first round completion of mapping and publication. Proposed new section to CASPUSS will add emphasis to planning for special project and programs other than mapping. What is a realistic scheduling for each survey area.

3. A continual concern in providing adequate and trained personnel with equal needs of staffing for the first round mapping and the plan for assistance after a modern survey is available to all users,

4. Several expressions were made for better definitions and design of mapping units and their coordination with the immediate and future needs of the local survey users.

5. The developement of effective data storage and retrieval systems that include computerization of both maps and interpretation along with an efficient method of keeping the data current and updated.

Charge 2

1. Almost all members expressed a need for a greater amount of management training for field soil scientists. Several types of training have been suggested. They range from classroom sessions on management principles, workshop type in-service or agency training courses and a rather unique how to do it kind of training provided by several contributers. Management training should be designed for soil scientists and their immediate activities.

2. A greater stress on providing interdisciplinary training between soil scientists and the other related disciplines of engineering, agronomy, economics, etc., involved directly with the interpretations of soils and the use of soils maps.

3. A continued and probably renewed emphasis on the training needed to provide and maintain the basic technical skills of a field soil

scientist. Both academic and field training are involved in this need and some feel this kind of simultaneous training has become dependent on the one on one contact with the party leader.

4. Concerns for the seemingly difficultness in providing formal technical training of field soil scientists during the GS-9 and GS-11 level tenure is shared by most of the committee in light of acceleration programs and tight 'schedules for completion.

5. Re-training plans for soil scientists shifting from different levels of surveying and totally different landscapes, soil associations and the like, need special coordination both nationally and regionally as well as at the state level.

Charge 3

1. Members all expressed a relative easy feeling about issuing supplements to reports by updating and reproducing new tables from the soils-5 type computerized data.

2. Recorrelation needs in updating presented several different ideas and most felt that updated photographic imagery, good map recompilation and transfer procedures and a supplemental publications was fairly effective.

a. Single use publications or supplemental type maps and interpretative materials need discussion by this group. It would seem that several good ideas and brochure or job sheet type publications could make this basic soil survey map much more usable.

4. A good system of evaluation was proffered by almost everyone in coming to the first determination for the needs of an update. Each evaluation requires individual considerations but most

seemed to suggest that there are basic points common to all surveys and a work sheet type appraisal could be an effective method to measure the kind of needs and set up the priorities of financial commitment.

5. Included is an example of an update of the James River Valley and Lamoure County, North Dakota Soil Survey. This is a rather simple update of incomplete older published tables and probably a good example of our immediate needs in many older surveys with adequate mapping.

6. Several members expressed the need to bring in additional expertise from the major users of the survey at the local level. Some felt. that more input should be solicited from the private sector of industry and business as to what they want from our survey and the soils data we can provide. Also expressed has been the need of greater participation of public and local users in the process of requesting updating needs and kinds of republications desires.

7. Newl·y prepared draft of Section 200 Part II of the National Soils Handbook was passed out to committee members by Victor Link (SCS) and comments were asked to help in final preparation of this section for guidance of the NCSS activities in updating and keep soil surveys current for future users.

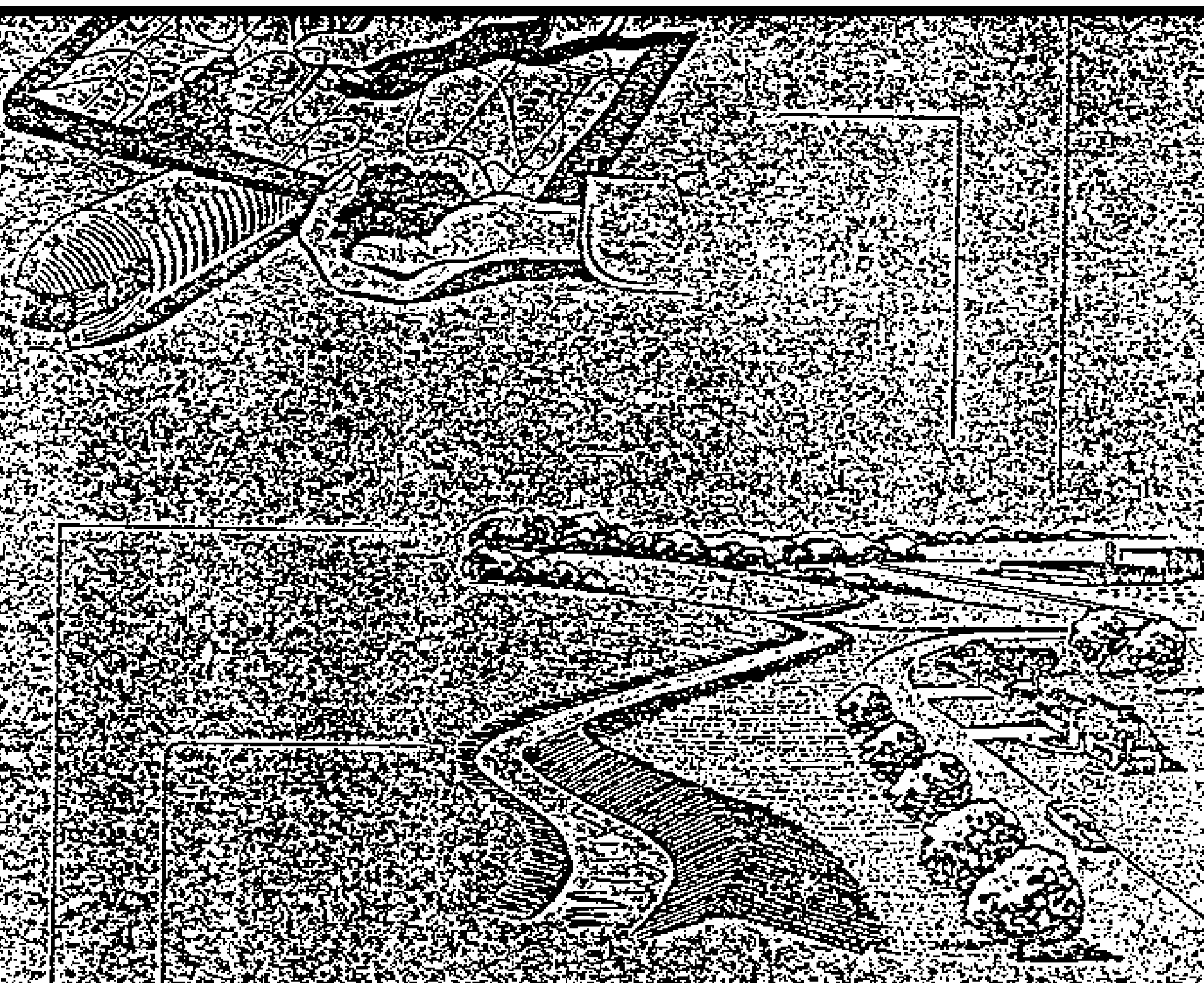
GILBERT R. LANDTISBR
Chairman
Committee 1

See attachments

1. Soil Survey Supplement Lamoure County, North Dakota
2. Draft NSH Part II Section (200) - 203 - 203.4

NCR Committee 1

SOIL INTERPRETATIONS



PREPARED BY: UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IN COOPERATION WITH: NORTH DAKOTA STATE UNIVERSITY

WEST LAMOURE COUNTY SOIL CONSERVATION DISTRICT

1980

HOW TO USE THIS TEXT

This text is usable only in conjunction with the soil maps, descriptions, and other information in the USDA Soil Survey - LaMoure County and Parts, of James River Valley, North Dakota issued May 1971.

Most of the information in this text is presented in tables. Preceeding each table is a brief discussion and explanation of its contents and intended use. Adequate understanding of these explanations will insure that the information is properly used.

1. <u>Use the Index to Map Sheets</u>

   In the 1971 Soil Survey the Index to Map Sheets divides the County into numbered blocks. The number inside the block corresponds to the map sheets in the back of the publication. Locate the general. area that you are interested in on the index and note the number (for example, 12).

2. <u>Use the Map Sheets</u>

   Turn to the Index to the Map Sheets and look up the proper sheet. When the proper sheet has been located, locate the specific area on the sheet that you want to study. For example, the town of Adrian is on Sheet 12. Then go to Hap Sheet 12 and find Adrian in the lower right hand corner. Soil boundaries are outlined by black lines, with a symbol for each soil mapping unit. Make a note of the soil mapping unit symbol(s) in the specific area that you are studying.

3. <u>Use the Soil Legend</u>

   Look up the map symbol in the soil legend in this text or in the 1971 Soil Survey. The symbols are listed alphabetically. When you have located the mapping symbol, read across for the soil name.

4. <u>Use the Tables</u>

After noting the soil symbol and name you are ready to look up the soil interpretations in any of the tables in this text. Refer to the List of tables in the Table of Contents for the page numbers of the tables you want to use. Be sure to read the explanations, preceeding each table.

Copies of the USDA Soil Survey - LaMoure County and Parts of James River Valley, North Dakota issued May 1971 are available from the East or West LaMoure County Soil Conservation Service offices-or from the North Dakota Agricultural Experiment Station, Fargo, North Dakota.

The user is cautioned that suitability

FOREWORD

The Soil Survey of LaMoure County and Parts of James River Valley, North Dakota was issued in 1971. The survey was made cooperatively by the North Dakota Agricultural Experiment Station and the Soil Conservation Service. The soil map and descriptions in the 1971 publication are reasonably complete and accurate by current standards. Since the soil survey was issued much has been learned about soil properties and interpretations. This Information can now be related to the soils of the area and used to predict soil behavior for a wider scope of land uses.

This text provides additional soil interpretations for the soils of the area. Interpretations are included for use of the soils as building sites, recreation development, sanitary facilities, and wildlife habitat. They will serve a variety of users ranging from farmers to loan agent* and from community planners to contractors.

CONTENTS

LIST OF TABLES

INTRODUCTION

Since the Soil Survey of LaMoure County and Parts of James River Valley, North Dakota was issued in 1971, additional data has accumulated that is useful in relating soil properties to soil behavior. These data permit more complete interpretations for each soil in the county.

The purpose of this text is to provide interpretations for the soils of Lamoure County and Parts of James River Valley in addition to those in the 1971 Soil Survey.

New hones, septic systems, sewage lagoons, service plants and roads are being constructed to meet the needs of the local people. They are on land formerly used for agriculture. Soil problems involve on-site waste disposal, basement and foundation drainage, road building and other construction works, erosion and the like.

Interpretations in this text provide information needed for use by the West LaMoure and East LaMoure County Soil Conservation Districts,. conservationists, county agents, farmers and landowners, homeowners, planners and planning commissions, health officials, consultants, engineers, developers, and others. The information can be used as a guide for good land use management.

Explanations of how the survey was made and descriptions of the soils are given in the Soil Survey of LaMoure County and Parts of James River Valley, North Dakota issued in 1971.

SOIL LEGEND

Symbol	Name
Ab	Aberdeen silt loam
Ae	Aberdeen-Exline complex
Af	Arveson fine sandy loam
An	Arveson fine sandy loam, very poorly drained
ArA	Arvilla sandy loam, level
ArB	Arvilla sandy loam, undulating
BaC	Barnes loam, rolling
BaC2	Barnes loam, rolling, eroded
BbC	Barnes-Buse loams, rolling
BbD	Barnes-Buse loams, hilly
Bc	Barnes-Cresbatd loams
Be	Barnes stony loam
BgA	Barnes, Gardena, and Eckman loams, level
BhC	Barnes-Renshaw loams, rolling
BnB	Barnes-Svea loams, undulating
Bo	Bearden silt loam
B r	Bearden silt loam, saline
Bs	Bearden-Exline complex
Bt	Borup silt loam
Bu	Borup silt loam, vary poorly drained
BvE	Buse-Barnes loams, steep
Ca	Cavour complex
Ce	Claire sandy loam
Ch	Colvin silty clay loam
CO	Colvin soils, saline
CS	Colvin soils. very poorly drained
Cu	Cresbard, Barnes, and Cavour loams
CV	Cresbard and Cavour loams

RECREATION

The soils of the survey area are rated in Table 1 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and Its scenic quality, the ability of the soils to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. On-site assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. Slight means that the soil properties are generally favorable and that the limitations. are minor and easily overcome. Moderate means that the limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in Table 1 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in Table 3, and interpretations for dwellings without basements and for local roads and streets, given in Table 4.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry.. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

TABLE [illegible].--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ab---Aberdeen	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
Ae*:					
Aberdeen	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
Exline	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
Af---Arveson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
An---Arveson	Severe: floods, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ArA---Arvilla	Slight	Slight	Slight	Slight	Moderate: droughty.
ArB---Arvilla	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BaC, BaC2---Barnes	Slight	Slight	Severe: slope.	Slight	Slight.
Be---Barnes	Slight	Slight	Severe: slope.	Slight	Moderate: large stones.
BbC*, BbD*:					
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Bc*:					
Barnes	Slight	Slight	Slight	Slight	Slight.
Cresbard	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
BgA*:					
Barnes	Slight	Slight	Slight	Slight	Slight.
Gardena	Slight	Slight	Slight	Slight	Slight.
[illegible]	Slight	Slight	Slight	Slight	Slight.
BhC*:					
Barnes	Slight	Slight	Severe: slope.	Slight	Slight.
Renshaw	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
BnB*:					
Barnes	Slight	Slight	Moderate: slope.	Slight	Slight.
Svea	Slight	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

WILDLIFE HABITAT

Soils directly affect the kind and amount of vegetation that'is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In Table 2, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor; or very poor. A rating of good means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of fair means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of poor means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but

TABLE 2.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ab: Aberdeen	Fair	Fair	Good	Fair	Very poor	Poor	Very poor	Very poor	Fair	Very poor	Very poor	Good
Ae*: Aberdeen	Fair	Fair	Good	Fair	Very poor	Poor	Very poor	Very poor	Fair	Very poor	Very poor	Good
[illegible]												
Af: [illegible]	Fair	Fair	Fair	Poor	Poor	Fair	Good	Good	Fair	Poor	Good	Fair.
An: Arveson	Fair	Fair	Poor	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Poor.
ArA, ArB: Arvilla	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Poor.
BaC, BaC2: Barnes	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Be: Barnes	Poor	Poor	Good	Good	Good	Fair	Poor	Very poor.	Poor	Good	Very poor.	Fair.
BbC*:												
Barnes	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
Buse	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
BbD*:												
[illegible]												
Buse	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Bc*:												
Barnes	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Cresbard	Good	Fair	Good	Fair	Very poor.	Poor	Very poor.	Very poor.	Good	Very poor.	Very poor.	Good.
BgA*:												
Barnes	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Gardena	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor	Fair.
Pelsan	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
BhC*:												
Barnes	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Renshaw	Poor	Fair	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor.

See footnote at end of table.

SANITARY FACILITIES

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of Interest to contractors and local officials. Table 3 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as slight, soils are generally favorable for the specified use and limitations are minor and easily overcome; if moderate, soil properties or site features are unfavorable for the specified use, but limitation can be overcome by special planning and design; and if severe, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms good, fair, or poor, which, respectively, mean about the same as the terms slight, moderate, and severe.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 24 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

TABLE 5.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab: Aberdeen	Severe: percs slowly.	Moderate: seepage, wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: excess sodium.
Ae*:					
Aberdeen	Severe: percs slowly.	Moderate: seepage, wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: excess sodium.
Exline	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey, excess sodium.	Severe: wetness.	Poor: too clayey, hard to pack, excess sodium.
Af: Arveson	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
An: Arveson	Severe: ponding, poor filter.	Severe: seepage, floods, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Ar1, Ar5: Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
BaC, BaC2: Barnes	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope	Fair: too clayey.
Ba: Barnes	Severe: percs slowly.	Severe: slope	Moderate: too clayey, slope	Moderate: slope	Fair: too clayey.
BbC*, BbD*:					
Barnes	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Bc*:					
Bearden	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Cresbard	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Bgk*:					
Parnell	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Gardena	Moderate: wetness.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: wetness.	Good.

See footnote at end of table.

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BUILDING SITE DEVELOPMENT

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in Table 4. A slight limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A moderate limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A severe limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

IMPORTANT FARMLANDS

Prime Farmland - is the land best suited for producing food, feed,. forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods. Prime farmland gives the highest yield with the lowest input of energy and money, and with the least damage to the environment.

Additional Farmland of Statewide Importance - is land other than prime that is valuable for the production of food, feed, forage, fiber, and oilseed crops. They are nearly prime farmlands.

Additional Farmland of Local Importance - is other farmland valuable for the production of food, feed, forage, fiber, and oilseed crops. It does not qualify as having prime or statewide importance. (Not designated in this report.)

Other land - is land that does not qualify for prime, statewide or local importance.

IMPORTANT FARMLANDS - LAMOURE COUNTY

Kind of Farmland	Percent of Land Surface	Acres	Potential Bushels Wheat	Production Potential Dollars of $4.00 Wheat		
Prime	69.0	501,967	16,866,091			
Statewide Importance	.1					

44 45

1.

PRIME FARMLAND SOILS

Symbol	Name
BgA	Barnes, Gardena, and Eckman loams, level
BnB	Barnes-Svea loams, undulating
Bo	Bearden silt loam
EaA	Eckman loam, level
EaB	Eckman loam, gently sloping
EbA	Edgeley loam, level
EbB	Edgeley loam, undulating
EdA	Egeland fine sandy loam, till substratum, level
EdB	Egeland fine sandy loam, till substratum, undulating
EeB	Egeland loam, till substratum, undulating
Em	Embden fine sandy loam
En	Embden fine sandy loam, silty substratum
Eo	Embden-Gardena loams, till. substratum
Ga	Gardena loam
GaB	Gardena loam, gently sloping
Gb	Gardena loam, silty substratum
Gc	Gardena loam, till substratum
GeA	Gardena and Eckman loams, level
Gl	Glyndon silt loam
GlB	Glyndon silt loam, gently sloping
Gn	Glyndon silt loam, silty substratum
GrB	Great Bend silty clay loam, gently sloping
GtA	Great Bend-Barnes complex, level
GtB	Great Bend-Barnes complex, undulating
Hf	Hamerly loam
Hg	Hamerly-Svea loams
La	LaDelle silt loam
LC	LaDelle silty clay loam

NCSS A Link 5/9/80

NSH - PART II

PROCEDURE GUIDE

SECTION 200

SOIL SURVEY OPERATIONS MANAGEMENT

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.4 Memorandum of Understanding for Soil Survey Areas to be Supplemented and Publication Procedures

203 EVALUATING, USING, AND UPDATING PUBLISHED SOIL SURVEYS

State Conservationists are responsible for maintaining the adequacy of published soil surveys for State and private lands. Within SCS policy and procedure guidelines, they coordinate Service activities with representatives of other Federal agencies who have the responsibility for maintaining the adequacy of soil survey information on federally administered lands. Soil Survey information in published soil surveys becomes outdated and must be periodically evaluated to determine if it meets current needs. The adequacy of existing soil survey information can only be evaluated if current needs are known and documented. Current needs are determined jointly between the SCS, cooperators, and users. All updating of published soil surveys will be based on documentation in sufficient detail to verify the need and and updating methods that will achieve Service objectives in a cost effective manner. Updating may vary from local issuance of revised soil interpretations to complete resurveying and publication. Two or more published soil surveys may be updated as a group to ensure uniformity and improve utility for planning the use and management of soil and related resources. Technical guides will be maintained current in accordance with SCS procedures. All updating will be by the most effective means to achieve the objectives.

203.1 Evaluation

The periodic evaluation of published soil surveys will be done and documented by SCS staff and appropriate cooperators. An evaluation is valid only if there are standards against which the existing material can be compared. Current and potential needs of users will be identified and used as standards for the evaluation. If remapping is planned, it must also be verified that the remapping can improve existing soil maps for the purposes intended in a cost effective manner. Published soil surveys occurring in the same Major Land Resource Area or similar area, will be evaluated to a common base to ensure the data can be compared, transferred, and integrated. Updating requirements will be a part of all State Annual Soil Survey Planning Conferences. A detailed plan for all updating is jointly developed vith cooperators and users. The evaluation will include:

(a) Soil Interpretations - Review the kind and accuracy of the soil interpretations. Some interpretations may now be available and applicable that were not included in the latest publication. Criteria for some interpretations may also have been revised since some older soil surveys were published. Land use changes and increased knowledge about soil response to different uses may also cause the need for updating the soil interpretations.

(b) Taxonomic Units

- Evaluate the concepts of the taxonomic units and determine adequacy for defining soil map units and for supporting the soil interpretations.

- betermine if the taxonomic unit descriptions are adequate to accurately classify the soils in Soil Taxonomy.

(c) Soil Map Units and Soil Haps

- Evaluate the composition of map units and the variation between delineations of each unit. Determine if map unit descriptions adequately characterize the map units. Identify inadequate map units and occurrence in the survey area. A systematic sampling method that can be documented will be used. A transecting procedure of an intensity to determine the composition for naming the map units and support soil interpretations for intended uses is generally adequate.

- Evaluate the accuracy of map unit boundaries and the adequacy of map detail. Determine aerial extent of the deficiencies and the degree of improvement that can be attained with updating procedures. This might be accomplished by randomly selecting tracts of land, such as 1 square mile, and remapping to meet current needs and objectives. Record all costs of remapping. Compare new mapping with existing mapping and evaluate if cost of new mapping and the additional information gained can be justified in comparison to other alternatives for updating present information.

- If existing soil map unit boundaries are adequate, evaluate the base used for the soil map. If base map deficiencies are the major problem with the existing soil map, then determine what alternative bases are available for preparing an updated soil map.

203.2 Plan for Updating

Published soil surveys that are out of print and do not need supplementing can be reprinted using procedures in NSH, Section 600. When an evaluation documenting the deficiencies of a published soil survey supports the need for updating, a plan will be developed detailing actions that will be taken to correct deficiencies. The TSC Head, Soil Staff, will provide technical coordination. The following actions, singularly or in combination, will be taken as needed to make soil information adequate for current needs.

(a) Update Soil Map Base - Where only the soil map base is inadequate, obtain a new base and transfer soil delineations and symbols. Issue new soil maps as needed.

(b) Update Soil Interpretations - Where only the soil interpretations are inadequate, prepare new or revised interpretations, and issued as needed.

(c) Recorrelate - Recorrelate when deficiencies in concepts of taxonomic units or map units are needed to support new or revised soil interpretations. As a minimum, the changes will be reviewed at the TSC when the updated material is to receive limited local distribution. Final correlation procedures, as stated in NSH, Section 300, are generally needed only when extensive remapping or supplemental mapping is done and the revised material is expected to be distributed statewide or broader.

(d) Supplemental Soil Mapping - When more detailed soil information is needed for areas of limited extent, document the purposes, map and record the supporting data, such as legend, map unit descriptions and interpretations. Issue supplemental information as needed on a local basis to achieve objectives.

(e) Remapping - The conditions that determine a decision to partially remap with limited local distribution of the revised soil maps and supplemental text or to resurvey and publish an entire area cannot be precisely defined for all situations. Many variables can exist for each soil survey area needing some remapping and all possible combinations are beyond advance definition. Rarely will there be a need to remap every acre in a published soil survey, yet at some lesser level of need, it becomes more practical and efficient to remap and publish the entire area using the existing information in the most efficient manner. When remapping is needed for only a few scattered areas, it usually is more practical to map on an individual request basis.

- When partial remapping is done, document supporting data, correlate, and prepare a supplemental text (including soil interpretations). Issue updated soil maps and text to meet objectives.

- When resurveying an area or parts of two or more areas equivalent to a survey area as defined in NSH, Section 201.1 is planned, approval of the Director, Soils Staff, is required before committing SCS resources. Requests for approval are made by submitting to the Director, Soils Staff, a draft memorandum of understanding specifically documenting how the resurvey will improve the existing material to meet current needs (see NSH, Section 202.1(b)(2)). When approval is obtained, use procedures that apply to surveying an area for the first time.

203.3 <u>Format for Supplements to Published Soil Surveys</u>

(a) <u>**Text**</u> - No standard format is prescribed for supplements to published soil surveys. Supplements in which the SCS is a cooperator will meet the technical standards of the NCSS and be edited by the SCS before publication. The format for individual parts of the supplement will be the same as that given for soil survey text in NSH, Section 603.1(a)(2). A supplement will:

- Be prepared at minimum cost to achieve specific local objectives;

- Be given a title the same as the original soil survey publication except the words "Supplement To" are added;

- Avoid duplication of material in the original text;

- Make direct reference to the soil maps and legend in the original-soil survey publication;

- Have an explanation of why and how the original soil survey is being supplemented along with the date of the supplement.

(b) Maps - When more than a few map unit delineations shown on the published soil map need revision, then supplemental soil maps will be prepared. The areas revised will be clearly identified on record copies of the old maps and on copies of the old maps for distribution. New maps and legends will meet NCSS standards and will be placed in the supplement together with new or revised soil descriptions if necessary.

If soil maps are revised on a request basis, only the revised mapping is transferred to a record copy of the published soil survey maintained in the field office. Maps in the record copy will be unbound in a looseleaf 3-ring binder.

203.4 Memorandum of Understanding for Soil Survey Areas to be Supplemented and Publication Procedures

A memorandum of understanding for the soil survey area is prepared for areas where supplemental text or maps are to be prepared for public distribution, or the area is to be remapped and published. Procedures in NSH, Section 202.1, will be followed.

The survey area is changed from published, "F" or "S," in the CASPUSS programm to progressive, "G," when a memorandum of understanding for the survey area is signed.

Committee 2 - Soil Interpretations

Committee Report

By Kenneth C. Hinkley, Chairman

Committee 2 has the following charges:

1. Develop the relationship of soil moisture regimes - soil water table depth.
2. Develop the criteria to determine soil capability class and soil capability subclass.
3. Format and content of soil interpretations material in published soil surveys.

Charge 1.

The committee feels there is a problem in understanding and communicating on soil moisture regimes and soil water table depths. It would be desirable if a better linkage between soil wetness classes, soil drainage classes, and soil taxonomic classes could be established. The soil wetness classification as in the proposed chapter 4 in the revised manual appears to address the problem:

The problems that seem to cause the most concern are water tables and soil drainage classes. Consensus is that the terms "perched" water table and "apparent" water table are confusing and do not adequately describe the nature of the water problems. In the Ustic and Aridic areas, many of the wet soils are saturated from the top down. They do not really have a water table at all except water standing on the surface periodically during the year, which wets the soil from the top down. Although the water may penetrate to an impermeable layer and then accumulate as perched water, the upper part of the soil is generally saturated without any kind of a water table. This process of water saturation in these soils is opposite of the process of water saturation in soils with an apparent water table, which are saturated from the lower part upward. These soils may also have water rise to and pond on the surface, but even though ponded are distinctly different in terms of water saturation processes. Although the aquic moisture regime can be defined in the highest categories in taxonomy to adequately cover both situations in terms of the whole soil being saturated, difficulties arise in the subgroups which require only the lower horizons to be saturated. At the subgroup level, it is difficult if not impossible to properly classify soils that are saturated from the surface downward.

Determining soil drainage classes and making other interpretations related to wetness, based on depth to high water table as we presently do is inadequate to cover soils that are saturated from the surface. One possible way of handling the interpretations would be in the map unit descriptions. Use of the term water table, as we use it in soil interpretations is misunderstood by many of our users.

The Committee discussed the use of the term water table. Some felt that the term should be replaced. Alternatives such as water saturation zone were discussed. It was concluded that at the present time the alternatives would not be an improvement. It is also recommended that definitons in soil taxonomy be modified to accommodate soils that have wetness problems, but are seldom saturated in the lower horizons. Also that soil interpretations be developed to adequately portray soil wetness problems, whether the source of water is at the surface saturating downward or underground saturating upward. Also that studies be initiated on duration and extent of saturated zones in soils, especially soils being saturated from the surface, to aid in classification and interpretation.

The committee proposed that somewhat poorly drained soils be in a "w" subclass in the woodland ordination system.

Charge 2.

The committee feels that there is a definite need for quantified criteria in the land capability classification and a need for consistency in application of the criteria. The committee discussed proposal that have been developed for revisions in the capability system. They recommended that the guide developed by the Technical Service Center be sent out again for review and comments and that a final guide be developed and sent to the National Office for consideration for their revision of the capability system.

Charge 3.

Most comments from the committee members relating to this charge were rather general with few recommendations for specific changes. Some states feel that there would be distinct advantages to grouping soils by windbreak groups and range sites. This would reduce repetition and excessive pages in many soil survey reports in the Great Plains. Other soil groupings were not suggested.

Walt Russell of the Forest Service made some specific comments relative to woodland. They are included for discussion as presented.

1. The name "woodland," is misleading as it is normally used in soil survey interpretations. Woodlands are used for many things, including wildlife habitat, recreation, watershed protection, timber production, etc. The interpretive material ascribed to "woodland" management nearly always applies only to one phase of woodland management -- timber production. Other interpretive tables in the report normally can be applied to woodlands as well as to other lands. Therefore, I propose changing the name of "woodland" interpretations to "Timber Management" interpretations.

2. We have some reservations about the ordination symbol concept. The assignment of a single ordination class to a soil tends to oversimplify the interpretive data presentation, especially where a soil is suited to two or more species which have different growth rates. The ordination class is a subjective rating that depends on which species is selected to represent the productivity of the soil. The soils should not be grouped by ordination classes. The soils should be listed individually in the Timber Management table. If the consensus of a cross-section of forestry users in a particular soil survey area favors using the ordination system, the ordination symbol could be listed for each soil. Otherwise, it should be omitted.

3. The usefulness of "site index" is limited when only one number is given. It has proven misleading in several instances.

Some indication should be given as to the range of variability to be expected for each important species on each soil. Consideration should also be given to expressing productivity in other terms, such as cubic feet per acre per year.

4. "Trees to plant" is a misleading term, because many times, stands of trees are regenerated by means other than planting.

5. The "erosion hazard" and "equipment limitations" columns should be expanded. Erosion hazard should be related to management practices and kinds of equipment to be used. A site may have one degree of erosion hazard for a logging operation and another erosion hazard for a regeneration project. The erosion hazard for regeneration might help determine whether a site would be disked and planted, or whether a less intensive method of site preparation might be used. By the same token, the erosion hazard of operating a rubber tired skidder might be quite different from the erosion hazard for a clearing and replanting operation.

6. There needs to be some interpretation of the ease or difficulty of regenerating new stands. This is essential because the National Forest Management Act of 1976 specifically prohibits timber harvesting on lands that cannot be adequately restocked within 5 years.

It is recommended that this committee be continued for the next conference.

This is a draft copy of a guide for determining capability classes and subclasses prepared by Paul R. Johnson, MTSC.

GUIDE A - For Placing Soils in Land Capability Subclasses Where the Growing Season is Over 120 Days, the P.E. Index is Greater than 44 or the Land is Irrigated, and Cool Temperatures do Not Limit Production of the Common Cultivated Crops

Groups of Soils as Defined by Selected Features	Subclass by Slope Classes A	B	C	D 1/
I. Deep and Moderately Deep				
1. Moderately through Rapidly Permeable				
a. Excessively through Somewhat Poorly Drained Soils with Following Surface Textures: 2/				
(1.1 Fine	s	e	e	e
(2.) Moderately fine through moderately coarse	s 3/	e	e	e
(3.) Coarse textured (Textural B) 4/	s	s	s	s
(4.) Coarse textured (Little or no Textural B)	s	s	s	s
b. Poorly and very poorly drained	w	w	w	w
2. Moderately Slowly Permeable Soils:				
a. well and moderately well drained	s 3/	e	e	e
b. Somewhat poorly drained	w	e	e	e
c. Poorly and very poorly drained	w	w	w	w

3. Slowly and Very Slowly Permeable Soils				
a. Well drained through excessively	s	e	e	e
b. Moderately well drained	w	e	e	e
c. Somewhat poorly drained	w	e	e	e
d. Poorly and Very poorly drained	w	w	w	w
II. Shallow Soils				
1. Well and Moderately Well Drained				
a. Rock within 10-20" of surface	s	e	e	e
b. Rock within 0-10" of surface or underlain by irregular bedrock with numerous or very numerous outcrops	s	s	s	s
2. Somewhat poorly through very poorly	w	w	w	w
III. Saline and Alkali Soils (Moderate or Severe Salinity or Alkality):	s	s	e	e
IV. Stone Soils (Class 2 through 5 Stoniness)	s	s	s	s
V. Soils Subject to Damaging Overflow:	w	w		

1/ Same subclass applicable for E, F, and G slopes where they occur.

2/ Somewhat Poorly Drained Soils on Positions that receive runoff from surrounding slopes are in subclass W on A slopes.

3/ Subclass not assigned to Class I soils. Soils with available water capacity greater than nine inches (based on depth to 60 inches) are in Class I.

4/ Includes normally droughty, fine to medium textured soils underlain by sand and gravel at depths less than 20 inches.

GUIDE B - For Placing Soils in Land Capability Subclasses Where the Growing Season is Over 120 Days, the P.E. Index Less than 44, High Wind Velocities Occur, and the Land is Not Irrigated.1/

Groups of Soils as Defined by Selected Features as Follows:2/	Subclass by Slope Classes3/ A	B	C	D
1. Moderately well through excessively drained, slowly through rapidly permeable, with following surface textures:				
a. Fine	s	e	e	e
b. Moderately fine and medium	c	e	e	e
c. Medium with high lime	e	e	e	e
d. Moderately coarse & coarse	e	e	e	e
2. Moderately well through excessively drained, deep and moderately deep soils with nearly impervious subsoils:	s	s	s	s
3. Somewhat poorly drained, deep and moderately deep soils:	w	e	e	e
4. Poorly and very poorly drained soils	w	w	w	w
5. Moderately well through excessively drained shallow soils:	s	s	s	s
6. Saline and Alkali soils (moderate to severe salinity or alkality)	s	s	s	s

7. Stoney soils (class 2 through 5 stoniness: | s | s | s | s |

7. Stoney soils (class 2 through 5 stoniness:	s	s	s	s
8. Soils subject to damaging overflow:	w	w		

1/ P.E. index refers to precipitation effectiveness as determined by Thornthwaite in the 1941 Yearbook of Agriculture. High wind velocities may be interpreted to mean that the daily wind velocity during critical seasons of the year will exceed 30 miles per hour for a 3-hour period.

2/ Many kinds of soil differing in other characteristics are included in each group. See Soil Survey Manual - page 213 for texture, 169-172 for drainage, 168 for permeability, and 217-218 for stoniness.

3/ For soils in capability classes II through VIII. Class I land excluded.

GUIDE C - For Placing Soils in Land Capability Subclasses Where no High Wind Velocities Occur and the Production of Common Cultivated Crops is Limited by Low Temperatures or by a Growing Season of Less than 120 Days.

Groups of Soils as Defined by Selected Features as Follows:[1]	Subclass by Slope Classes[2]			
1. Moderately through rapidly permeable, moderately well through excessively drained, deep and moderately deep soils with following surface textures:				
a. Fine	s	e	e	e
b. Moderately fine through moderately coarse	c	e	e	e
c. Coarse with Textural B	s	s	e	e
d. Coarse without Textural B	s	s	s	s
2. Moderately slowly permeable, deep and moderately deep soils with following drainage class:				
a. Well drained	c	e	e	e
b. Moderately well	c	e	e	e
c. Somewhat poorly	w	e	e	e
3. Slowly and very slowly permeable, deep and moderately deep soils: with following drainage class:				
a. Well drained	s	e	e	e
b. Moderately well	w	e	e	e
c. Somewhat poorly	w	e	e	e

4. Poorly and Very Poorly Drained Soils:	w	w	w	w
5. Moderately well through excessively drained, shallow soils:				
a. Rock within 10 to 20 inches of surface	s	s	e	e
b. Rock within 10 inches of surface or within 20 inches but depth to rock varies between 0 and 20 inches	s	s	s	s
6. Saline and Alkali soils (Moderate to severe salinity or alkalinity):	s	s	s	s
7. Soils subject to damaging overflow	w	w	w	w

1/ Many kinds of soil differing in other characteristics are included in each group. See Soil Survey Manual - page 213 for texture, 169-172 for drainage, 168 for permeability, and 217-218 for stoniness.

2/ For soils in capability classes II through VIII. Class I land excluded.

GUIDE FOR PLACING SOILS IN CAPABILITY CLASSES
MIDWEST REGION

CAPABILITY CLASS	MINIMUM DEPTH (IN)	SURFACE TEXTURE	AVAILABLE WATER CAPACITY (0-60") (IN)	PERMEABILITY	RESIDUAL WETNESS	MAXIMUM SLOPE %	FLOODING DANGER	SALINITY OR ALKALINITY	GROWING SEASON	P.E.	EROSION HAZARD	CROPPING RESTRICTIONS
I	40		HIGH(9"+)	MOD. RAPID MOD. MOD. SLOW	SLIGHT MW + :MOD.SL. + SWP :MOD. + 1/	2	SLIGHT	NONE	ROW CROPS MATURE	44+		
			MOD.(6-9")	RAPID SLOW	MODERATE MW :SLOW	6	OCCASIONAL	SLIGHT	ROW CROPS DO NOT MATURE	31-44	MODERATE	MODERATE
		S C (>60%) PEAT	)	V V	SEVERE MW :V.SLOW SWP :V.SLOW P :V.SLOW	14		MODERATE	SMALL GRAIN FREQUENTLY DO NOT MATURE		SEVERE	SEVERE
					VERY SEVERE DRAINAGE NOT FEASIBLE BUT PASTURE AND LIMITED CROPPING POSSIBLE	20	FREQUENT	SEVERE	SMALL GRAIN SELDOM MATURES		V.SEVERE	V.SEVERE
V	20				WETNESS LIMITS CHOICE OF CROPS TO PERMANENT VEGETATION OF GOOD QUALITY	2	CROPPING NOT FEASIBLE		SMALL GRAIN DOES NOT MATURE		NONE OR SLIGHT	NOT CULTIVATED PASTURE IMPROVEMENT PRACTICAL
VI	10				KIND AND QUALITY OF PERMANENT VEGETATION IS LIMITED	35	CHANELLED	LIMITS USE TO PERMANENT VEGETATION				NOT CULTIVATED PASTURE IMPROVEMENT PRACTICAL
VII					WETNESS LIMITS VEGERANT SPECIES		PONDING LIMITS VEGETATION TO WATER TOLERANT TREES	LIMITED TO SALT TOLERANT SPECIES	GRASS AND TREES WILL GROW			NOT CULTIVATED PASTURE IMPROVEMENT NOT PRACTICAL
VIII					PONDING PREVENTS ECONOMICAL PLANT PRODUCTION		NO USEFUL VEGETATION					NO COMMERCIAL PLANT PRODUCTION

1/ Soils in depressed areas receiving runoff from surrounding slopes have moderate wetness limitations and are placed in Class II.

Conference Report

Committee 3 - NCRWPC

Soil-Water relations, including movement in soil landscapes

In this report we will outline the committee charges and follow with the comments and suggestions received and reviewed.

Charge 1. Continue to develop inputs that the soil survey can contribute to hydrologic modeling in small watersheds.

The initial discussion of this charge was at the Traverse City meetings (1976) of this committee. There seems to be general agreement that the soil survey can and should develop inputs to this modeling effort since several necessary parameters relate to the landscape and characteristics of soils on it.

While the primary contribution of the soil survey is in showing the distribution and extent of various soils in the particular geomorphic setting, the associated parameters of slope length, curvature, profile permeability, bulk densities, cover conditions, present erosion conditions, boundaries of the watershed can be shown or derived. With respect to these various parameters discussion brought out that more drainage detail should be retained particularly on upper portions of the landscape. This is necessary to better define slope length and routing characteristics of water flow. There was a suggestion that this detail might be retained as a separate overlay over and above map compilation "needs".

Charge 2a. Identify research needs and make recommendations for attaining information on water movement and moisture relationships in frozen soils.

There is no reported current activity in this region on this subject.

It was recognized by several states as of useful value - for more than the gravediggers of Wisconsin! Early spring cultural practices in the Red River Valley, and probably other areas, are rather contingent on thawing events. Of more interest and application would be a description of the temperature regime in the rooting zone as modified by the moisture regime in various parts of the landscape.

Charge 2b. Identify research needs pertaining to the available water for crops, grasses, and trees in soils with fragipans.

There is general recognition of the influence of fragipans (or dense basal till) on water movement and plant root development. Considerable research has been done, including studies of lateral water movement. There may be some question as to inclusion or exclusion of fragipan in estimation of plant available water. Some states report including the fragipan zone in estimating plant available water; some do not. The decision may be made partly on the known, or presumed, extent of root development. In Minnesota observations indicate no appreciable alfalfa rooting in the fragipan.

<u>Charge 3</u>. Suggest ways of incorporation - into the Soil Survey program - methods forcharacterizing soil water movement and retention over the range

The committee supports the proposal - as also outlined in the (new) Chapter 4 of the Soil Survey Manual - of attempting to derive a dynamic picture of the soil-water state from field measurements using the proposed terminology of D (dry). M (moist) and W (wet). The annual regime would be characterized by depth to at least 100 cm (perhaps deeper for forestry applications) and by months. A minimum observation time was suggested as two years but more reliably 4 or 5 years at selected sites in the landscapes. These sites might be coincident with the piezometer observations noted above. This characterization of the soil water dynamic will greatly aid a number of interpretations. From committee correspondence it is apparent that water table (?)- piezometer - open tube - observations have been, and are being made in the course of the soil survey in many areas (Wisconsin, Minnesota, Indiana, Ohio, others?).

This field approach would seem to be a good way to summarize various kinds of soil moisture studies on a more or less equivalent basis. Data from simple field estimates, instrumented installations, or from sets of piezometers could be used. A relatively simple way to obtain some moisture regime information is to use sets of piezometers to determine the location (top and/or bottom) of any saturated or wet zones. Moisture states at less than saturation (moist and dry) can be estimated by using the field clues suggested in the standards defining the Soil-Water States. This information could then be combined in an "Annual Soil-Water Regime" table. Such a table would provide a factual basis for statements about the use of a soil. Wisconsin reports some work on annual soil-water regimes.

Charge 4. Establish a procedure for including in the standard pedon description-information on observed surface conditions including cracks, crusts, aggregation and porosity.

There is some agreement that transient (surface) conditions can and should be recorded. There is no standard format for this. Perhaps it should be incorporated in the standard pedon description. Crusting seems to be judged an important characteristic.

Current work at Minnesota involves a study of crusting and surface sealing phenomena. Thin sections are made of surface soil materials subjected to infiltration, or rainfall energy impact (simulated). The sections are analyzed for reduction in pore size and altered nature of pore size distribution. A variety of Mollisols and Alfisols are being studied. Committee correspondence suggests that the crusting phenomena may be the more critical (for seedling emergence), although the sealing phenomena affects runoff.

With respect to the soil landscapes: There is considerable water "table" or soil-water regime data being gathered in the course of soil surveys (Wisconsin, Ohio, Minnesota, Iowa, Indiana, ?). The data seems to correlate with morphology except in the case of some well-drained soils (Indiana, Ohio).

While there is general agreement that the position of the saturated zone does correspond to the presence of mottled colors or more uniform greyish colors, there is also the belief that the morphologic colors may say as much about the oxygen state of the water as about the position of a saturated water zone.

In certain landscapes, or portions of it, soils will wet from the top down and, in other positions, from the bottom up. Therefore at some point and in some landscapes there may be a problem in distinguishing between the phreatic water zone and a perched water zone. So there is the possibility that certain horizons will be dry and others, moist or wet.

The conference agreed that the committee should be continued. It was noted that the question of water tables and their morphologic significance was a topic of several committees.

Members of Committee 3:

O.W. Baumer+
R.L. Christman*+
K.R. Everett
D.P. Franzmeier*+
F.D. Hole+

A.S. Messenger*+
E.J. Pope*
W. Scott
C.L. Scrivner

E. Gamble*+, Vice-Chairman

R. Rust*, Chairman

*Present at conference
+Correspondence incorporated

REPORT OF COMMITTEE 4, SOIL POTENTIALS

Charge

For each major land use (cropland, rangeland, urban land, etc.) identify the data needed and the source of the data for determining soil potential.

Committee Members:

Leon R. Davis - Vice Chairman
Wells F. Andrews
James G. Bockheim
James A. Bowles
Paul E. Minor
Delbert L. Mokma
Miles W. Smalley
Neil E. Smeck
Edward Tompkins
Lawrence A. Tornes

Committee Approach:

1. The committee chose one urban land use to use as an example for the initial stages

To satisfy the charge, Committee 4, with the help of those attending the meeting, arrived at a sample form to be used in any given county to initiate a soil potential study.

The form has been kept as simple as possible. The form is prepared for only one land use: dwellings with basements. The form is a tool for recording data on factors affecting any given land use; data sources of people that can contribute to arriving at corrective measures; and data sources for any continuing limitations and the costs involved in overcoming the factors are recorded.

To use the form, you must first select the land use you are going to prepare soil

Major Land Use: Dwellings with Basements

Factors affecging land use	Factors in column 1	Corrective measures 1/	
Water table	2,5	3,6,8,9,10,12, 13.14	
Depth to bedrock, sand, gravel. cemented pans, etc.	2,3,9	3,6,8,9,10,11,12, 13.14	
Shrink-swell	2.3	3,6,8,9,10,12 13.14	
Slope (consider slippage)	3	3,6,8,9,10,11,12, 13.14	
Flooding	2,3,4,5,9	[illegible]	

The committee feels that soil potential ratings can play a vital part in sound land use planning if prepared according to present guidelines in the National Soils Handbook. We suggest that perhaps this table could become an additional appendix to the present tables in Section 404 - Soil Potentials.

Recommendations of Committee 4 are:

1. Continued promotion of the development of soil potential ratings. It appears to be a very effective tool in enhancing the use of the soil survey.

2. Each state (start and, if possible) complete soil potential ratings on at least one land use in one or more counties before the next NCR soil survey workshop.

3. An education campaign be carried out on state and local levels to encourage the development and use of soil potential ratings.

4. The committee be continued with a suggested charge of "Summarize the benefit and concerns encountered in initiating and completing soil potential studies," snd to suggest any needed changes in the guidelines for data collection or preparation of potentials.

Are there any comments?

The conference accepted the report of Committee 4.

John I. Brubacher
John I. Brubacher
Chairman, Committee 4

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
OF THE NATIONAL COOPERATIVE SOIL SURVEY

MAY 19-22, 1980

LAFAYETTE, INDIANA

COMMITTEE 5: Educational Activities for Soil Resources and Land Use.

BACKGROUND:

1. Committee 5 is the current extension of committee 6 of the same title from the 1978 North Central Region Work Planning Conference.

2. Much of the committee work was accomplished by correspondence prior to the meeting at Lafayette.

3. A total of 13 individuals are assigned to this committee. Six of the 13 committee members were present at Lafayette. An additional 10 individuals participated in committee activities at Lafayette.

CHARGES: The steering committee identified seven charges for the committee to address.

1. Develop a model for soil survey educational programs to inform the public about soil surveys and use of soil surveys.

2. Address the teaching effectiveness of large-sized groups versus small-sized groups of 3 to 5 people. Include an analysis of group size for training of inexperienced soil scientists in field mapping techniques.

3. Explore ways to provide additional emphasis on interpretation of soil surveys in undergraduate courses. The primary objective of this charge is to address how to develop expertise in understanding and using soil survey reports.

4. Review the applicability of the Soil Conservation Service correspondence course on "Soil-Soil Surveys and Their Uses".

5. Explore the possibility of developing a correspondence course on Soil Taxonomy and its application.

6. Explore the possibility of developing a correspondence course on Soil Interpretation.

7. Propose alternative courses of action for a regional travel course.

APPROACH: Similar charges had been addressed by committee 6 - Educational Activities for Soil Resources and Land Use at the 1978 North Central Regional Work Planning Conference of the National Cooperative Soil Survey held at Madison, Wisconsin (see pages 46-72 of the 1978 proceedings). The present committee 5 reviewed the above charges and the conclusions and recommendations of the 1978 committee. On the basis of this review, committee 5 agreed to address the following charges.

1. Develop a laboratory manual for teaching field techniques and soil interpretation in soil morphology, genesis, and classification per 1978 NCRWPC Committee recommendations.

2. Develop an undergraduate correspondence course in soil taxonomy per 1978 NCRWC Committee recommendations.

3. Develop an undergraduate correspondence course in soil interpretations per 1978 NCRWPC Committee recommendations.

4. Develop a regional travel course per 1978 NCRWPC Committee recommendations.

5. Review the current Soil Conservation Service correspondence course, "Soils - Soil Surveys and Their Uses", and determine if the 1978 NCRWPC Committee recommendations have been considered by the SCS.

6. Explore the possibilities of further developing the use of mass media in soil survey educational programs.

FINDINGS:

1. Charge 1. Develop a laboratory manual for teaching field techniques and soil interpretation in soil morphology, genesis, and classification per 1978 NCRWPC Committee 6 recommendations.

   a. Determined that a manual is needed for teaching field soil survey techniques for advanced undergraduate students. A manual is also needed for teaching soil interpretations for undergraduate students.

   b. Agreed that the needed manuals would require the initiative and commitment of one or more individuals who would be willing to devote considerable time to this effort.

   c. Agreed that local soil and landscape conditions dictate, in part, specific orientation of each individual instructor's course outline. Therefore, it may be difficult to construct a manual that would be completely suitable for use in all areas of the region.

   d. Agreed that this charge could be partially addressed by establishing a network for exchange of course outlines for courses in soil survey field techniques. In addition, an exchange network could include materials for soil interpretations.

2. Charge 2. Develop an undergraduate correspondence course in soil taxonomy per 1978 NCRWC Committee recommendations. The findings are incorporated into the findings of Charge 3, below.

3. Charge 3. Develop an undergraduate correspondence course in soil interpretations per 1978 NCRWPC Committee recommendations.

a. Determined that these courses are needed. Also, agreed that the needed materials for preparing and executing these courses would require a sizable commitment of one or more individuals who would be willing to devote considerable time to this effort.

b. Reported that following the 1978 NCRWPC Committee recommendations contact was made with the continuing Education Division (CED) at Kansas University concerning the possibility of sponsorship of correspondence courses. The Kansas University CED expressed an interest in providing support for development of the logistical requirements of correspondence courses in soil taxonomy and soil interpretation.

c. Agreed that the committee should continue to pursue the concept of developing correspondence courses for soil taxonomy and soil interpretations. And the committee should continue to seek contributors willing to contribute to development of course materials as well as sponsors to provide the logistical services for offering these courses.

4. Charge 4. Develop a regional travel course per 1978 NCRWPC Committee recommendations.

   a. Reviewed information concerning this charge which previously was discussed and reported in the 1976 and 1978 NCRWF'C reports.

   b. Heard a report by Dr. Steven Messenger, Department of Geography, Northern Illinois University, DeKalb, Illinois. Dr. Messenger currently offers a biennial ll-day travel course for advanced undergraduate and graduate level students who major in soils. The course is now offered through the Northern Illinois University Extension Division. A limited number of spaces are available for participation by persons other than students from Northern Illinois University. The course is offered in odd years and the next offering is scheduled for August 1981. Dr. Messenger indicated that he would be pleased to have the Northern Illinois University Extension Division mail preliminary announcements concerning the travel course to each state in the North Central Region.

5. Charge 5. Review the applicability of the Soil Conservation Service correspondence course on "Soil - Soil Surveys and Their Uses", and determine if the 1978 NCRWPC Committee 6 recommendations have been considered by the Soil Conservation Service.

   a. A subcommittee of committee 5 reviewed the 1978 NCRWPC report concerning the results of a survey made of persons who had completed the course. The subcommittee agreed that the comments reported from previous NCRWPC minutes were pertinent. In addition, the subcommittee reported:

      (1) Mr. Rex Tracy of the Employee Development Office of the SCS in Washington, D.C., is currently conducting an in-depth review of the course. A copy of the 1978 NCRWPC subcommittee report has been sent to Mr. Tracy. The following comments and suggestions are the results of a review of the course materials.

(2) Better coordination of the objectives and questions is needed. The objectives are very general and vaguely stated while many of the evaluation questions are specific and require information beyond that available in assigned readings. The objectives should be rewritten as performance objectives with the evaluation questions tied directly back to them. The evaluation section needs to be revised to reflect the goals of the course, remove ambiguous questions and improve the reliability of the questions in evaluating the student's learning.

(3) The assigned readings need to be reevaluated. Many of the references are not readily available (example: Jenny, H 1941. Factors of Soil Formation. McGraw-Hill Book). A cross reference needs to be included with the assigned readings to locate the soil memorandums in the National Soils Handbook. The soil memorandums need to be updated as many of them have been superceded by more current material. The references should be assigned more selectively to give the students a contemporary overview of the subject matter without an excessive amount of reading.

(4) Considering that the course is designed for non-soil scientists a larger proportion of the lessons should be devoted to the proper utilization of soil survey information. A discussion on the use of soil survey reports for the delineation of Prime and Unique farmland would be a valuable addition for many users, The concept of soil potentials should also be introduced.

(5) An instructor's manual needs to be prepared as a guide for the State Soil Scientist who coordinates the course in each state. A manual would help assure uniformity among the states and possibly increase the enrollment in the course by reducing the time requirement and responsibility of the instructors.

b. Learned that the South Dakota State Soil Scientist currently is using the course material in workshop sessions. He has made major revisions in the course outline and content.

6. Charge 6. Explore the possibilities of further developing the use of mass media in soil survey educational programs.

a. Discussion centered on the need for 15 to 20 second TV spots designed to create general public awareness of soil surveys.

b. Learned that the North Central Region Education Materials Project located at Iowa State University, the Extension Information Offices at each land-grant university, and the Information Division of the Soil Conservation Service had expertise in the production of TV spots.

c. Agreed that TV spots need to be oriented to broad audiences, not just to the traditional farm audience.

d. Reviewed a report concerning activities of soil and land use specialists of the Cooperative Extension Service, University of Missouri. The report indicated that short videotapes and radio spots will be developed within the next year by the University of Missouri.

e. Agreed that some form of financing would be required if the efforts to develop TV spots were pursued by Committee 5.

CHARGES CCMPLETED:

1. The need for a laboratory manual for teaching field techniques and soil interpretation in soil morphology, genesis, and classification has been resolved by establishing an information exchange program. The in-coming chairman of Committee 5 will need to initiate a letter which describes the activities of this committee. In addition, the chairman must identify individuals to volunteer to participate in the exchange effort.

2. The continuing need for sponsorship of a regional travel course has been resolved. The committee chairman will forward Dr. Steven Messenger a listing of the NCR-3 representatives. Dr. Messenger will in turn contact these individuals concerning the dates and logistical requirements for the ll-day travel course sponsored by Northern Illinois University.

RECOMMENDATIONS:

1. That Committee 5, "Educational Activities for Soil Resources and Land Use". be continued as a committee of the 1982 North Central Region Work Planning Conference.

2. That the committee be charged with activities and responsibilities outlined in the following paragraphs.

   a. Charge 1 as related to the development of a laboratory manual.

      (1) That an exchange network be established for courses in teaching field soil survey techniques. Exchange of materials would include those courses that are currently offered at the upper undergraduate and graduate level.

      (2) That an exchange program be instituted for laboratory source materials concerning soil interpretations.

      (3) That both exchange programs be initiated and set in motion by the incoming committee chairman prior to the 1982 NCRWPC meeting.

   b. Charges 2 and 3 as related to the development of undergraduate courses in soil taxonomy and soil interpretations.

      (1) That the committee continue to provide leadership for the development of correspondence courses in soil taxonomy and soil interpretations.

(2) That a letter be submitted to Agronomy News, the National Association of College Teachers in Agriculture Journal, and other appropriate newsletters and journals describing the committee's efforts concerning correspondence courses. The letter should address the need for an individual or individuals to prepare and develop the two correspondence courses. In addition, the letter should note that the committee is interested in identifying institutions interested in offering such courses. A draft letter was prepared and is attached as an appendix to this report.

(3) Continue to maintain contact with the Continuing Education Division at Kansas University. The current contact person is Ms. Nancy Colyer, Director, Independent Study. Telephone 913-864-4792.

c. Charge 5 as related to the Soil Conservation Service correspondence course. Renew the committee's support of this course and continue to extend an offer to assist, if requested, in review or revision of the course.

d. Charge 6 as related to development of mass media.

(1) That the North Central Region Education Materials Project and the Information Division, Soil Conservation Service, be approached concerning the development and financing of TV spots designed to create general public awareness of soil surveys.

(2) Investigate information transfer technologies for application in soil survey educational programs. including both extension and resident teaching.

Submitted by:

Gerald A. Miller
Committee Chairman

Committee Members:

Albert Beavers
*Orville Bidwell
Raymond Diedrick
Lowell Hanson
Milo Harpstead
Chris Johannsen
*Gary Lemme
*Dale Lockridge
Douglas Malo
*Steven Messenger
*Gerald Miller, Chairman
*Robert Pope, Vice-Chairman
Gary Steinhart

*Committee members in attendance at the NCRWPC, Lafayette.

Other individuals contributing to the committee session at the NCRWPC, Lafayette.

James Anderson
Dick Christman
Leon Davis
Charles Fisher
Phillip Harlan
Ivan Jansen
Gerhard Lee
Miles Smalley
Neil Smeck
Michael Thompson

Appendix attached.

Appendix 1 to Committee 5 Report

Draft letter to be mailed to Agronomy Newsletter, the National Association of College Teachers in Agriculture Journal, and other appropriate newsletters and journals.

Interest in the development and implementation of collegiate courses in soil taxonomy and soil interpretations was expressed in a recent study conducted by a North Central Regional Committee of the National Cooperative Soil Survey.

One university has expressed an interest in sponsoring these courses as part of its continuing education program in which a royalty arrangement could be arranged.

Interested persons should contact: Dr. Gerald Miller
Department of Agronomy
Iowa State University
Ames, Iowa 50011

CC: NACTA Journal
Agronomy News
Journal Agron. Education

North Central Regional Work Planning Conference

of the

National Cooperative Soil Survey

May 19-22, 1980
LaFayette, Indiana

Committee 6 Report
Soil Correlation and Classification

Committee 6 consisted of 13 members. Seven members were present at this conference. Eleven members responded by letter to the charges of this committee, a list of the Workshop participants who attended this committee are appended.

Charges to this committee were:

1. Describe each "soil drainage class" as they are used in your area (include in your discussion their relation to taxonomy at the subgroup category) and/or as you use them.

2. List briefly soil correlation problems that exist so that further improvement in the correlation process might take place.

3. List any problem that exists in soil taxonomy as it affects soil classification.

Comments on Item 1 above - soil drainage classes.

The Chairman, after opening remarks concerning soil drainage classes, asked that the question of whether to retain soil drainage classes be considered. Each of the 11 respondents in this committee made adequate statements concerning the use of soil drainage classes in their area. More than half indicated they were using soil drainage classes essentially as given in U.S.D.A. Handbook No. 18. Others are using depth to water table in addition to criteria defined in Handbook 18. Their use in various states will be summarized more fully in the final report to the Workshop Chairman.

In dealing with soil drainage classes it was fairly well agreed that we were dealing with water tables (or zones of saturation) at different levels in the soil profile for varying periods of time throughout the year.

During this discussion Mike Stout talked about new soil moisture terminology being proposed by the National Workshop. This is to be called "Soil Water State" and is designed to indicate the dynamics of soil water during a cyclic period of time e.g., a year. This contrastswith the "soil drainage classes" in that they seem to be a static condition of-soil moisture status as exhibited in soil profile morphology. Most people have indicated that "soil drainage classes" have been used for a long period of time and are better understood by the general users of soil survey information. Many, or even most time, "soil drainage classes" serve to tell the user as much as he wants to know about soil wetness. The new proposed "Soil Water States" would go even further and tell the degree and timing of water saturation in the soil profile. Soil temperature is also important here. There appears to be some overlap in committee responsibilities here in that the "Soil Water States" are also the province of Committee 3 - Soil Water Relations, and Committee 2 "Soil Interpretation".

At the present time drainage classes are not a part of the Soil Rating Program for Soil Interpretation. They have been replaced by depth to seasonal high water table.

The question of oxygenated water versus stagnant water was brought up and its possible effect on not only plants but on soil morphological characteristics. After much discussion, the question was asked "Should we retain the present Soils Drainage Class definition as outlined by MTSC and the National 'Workshop and amended to include appropriate depths to water table or zones of saturation."

It was voted unanimously that the above drainage classes be retained for use.

The consensus of this committee was also to approve the further development of the "Soil Water State" criteria as initialed by the National Work Planning Committee.

Comments on Item 2 above: Soil Correlation Problem

1. During a soil survey, at what point does the number of mapping units (soils) become final for all intents and purposes? Not much discussion of this point. No definite conclusion.

2. The Chairman indicated that in some counties in Illinois there were no severely eroded units and that in some survey areas the cartographic map units seems to be large. The documentation and acreage of mapping units was stressed as being highly important in the correlation process. What we do at the initial review to set the tone of the soil survey is highly important. It can save a lot of resorting of problems at the end of the field mapping. Mike Stout indicated he kept all documentation of map units presented to him.

3. Some discussion of taxonomic map units and cartographic map units.

4. Vic Link commented on the idea of a separate brochure to tell how a soil report may be used. It would be a brochure that could

5. Concerning the use of soil maps, Hollis Omodt said that the limitation of any kind of a soil map are largely ignored by the user. Mike Stout indicated that some soil scientists still think that the order 2 surveys are site specific where as they are not.

6. The increasing use of taxadjunct "as discussed. Some newer correlation have only 2 or 3 taxadjuncts while 6 or 7 years ago some counties ran as high as 60% taxadjuncts. It seems the more data we have about our soils the more prone we are to have taxadjuncts.

7. Mike Stout spoke to the point that not all soils in one family are treated the same. that is, they do not have the same or very similar interpretation. Families should be checked for interpretation at the state level. No one seemed to disagree with this suggestion. Correlation of characteristics for prime land placement seems to be causing some trouble at state lines.

a. Sometimes we are asked to back up interpretation with "hard data." It would be almost impossible to get hard data for all interpretation and all soils. Will remain a problem when clled into court on specific uses of specific soils.

9. It has been agreed that eroded Mollisols will be classified as Mollisols rather than Alfisols in order to emphasize genesis. This fits in well with our foreign soil scientists thinking when genesis is emphasized more.

Comments on Item 3 above: Soil Taxonomy.

Not much discussion time "as given to this topic during the committee meeting. Many items were listed by committee members in their submitted reports which will be included in the final report of this committee to the Secretary of this Workshop.

Two items that were discussed were as follows:

1. Use of modifiers for texture such as "light" and "heavy". It was generally, but not universely, accepted that these modifiers were not the best but that there "as nothing to prevent the use of "% clay" following the texture term in the soil description to say separate the fine silty family from the fine family.

2. A small discussion ensured concerning the distinction between Eutroboralfs and other subgroups that have zones of clay accumulation less than 25 cm thick.

committee 6.

John D. Alexander - Chairman
George W. Hudelson - Vice-Chairman
Lindo J. Bartelli
Eric Bourdo
Edward L. Bruns
Thomas E. Fenton
Ronald J. Kuehl
D. Rex Mapes
Gary B. Muckel
Roy M. Smith
Neil Stroesenteuther
Robert I. Turner
David Van Houten

North Central Regional Work-Planning Conference
of the Cooperative Soil Survey
Lafayette, Indians
May 19-22, 1980

Committee 7: Using Soil as a Medium for Treating Wastes

Charges:

1. Test degree of soil limitation ratings by application of criteria to mapping units in four survey areas distributed throughout the region so as to represent different soil and climate conditions.

2. For the same survey areas (for all mapping units) (a) develop soil potential ratings as a treatment medium for waste products, and (b) develop animal waste application rates and schedules for defined cropping systems.

3. Review and report on what Experiment Stations, Universities, ARS and other research groups in the region are doing in the area of use of soil as a treatment medium for waste products.

Committee Approach:

The charges to the committee remained the same as for the 1978 meetings in Madison. At that meeting the committee worked primarily on Charges 1 and 2a with a study of using potential ratings for soils from four counties located around the region. For the 1980 meeting the responses from the committee members indicated that they would like to study charges 2b and to some extent charge 3.

Developing animal waste application rates and schedules for defined cropping systems

It was assumed that this charge implied that the committee was to determine the rates according to either soil series or at least soil properties. A quick check of the literature (not at all inclusive) suggests that for the North Central Region there has been little research relating series or Soil properties to application rates. Inputs at the Conference may turn up more related re. earch. The brief attached table gives some idea about the dependence of the rate schedules (or lack thereof) on soil information. Although there may be exceptions, the basic philosophy in determining the quantity of animal waste to apply centers on nitrogen requirement of the crop to be grown, the plant nutrient content in the manure and the soil test. Little or no emphasis seems to be placed on soil properties although landscape position does seem to be important in some reports. Most literature reporting on rates of application do not bother to name the soil on which the application took place.

In most cases, studies that involve land application of sewage sludge are more concerned about soil properties than in studies of manure application. This increased concern is probably related to the newness of the operation, more public awareness, greater possibility of toxic material being present, and more state and federal controls. An example of this difference in concern for soil properties can be seen by comparing the Ohio guides for livestock waste disposal with the same state's guide for sewage sludge application. A copy of the section On Site Selection and Management from the Ohio sewage sludge application guide is attached.

A number of items need to be discussed at the Conference before final recommendations can be made concerning developing animal waste application rates and schedules.

1. Should our approach be one of manure utilization or manure disposal?

2. Should the rate of application be based on nitrogen content of the manure or on phosphorus content? Basing on phosphorus will usually make rates much lower than basing on nitrogen.

3. What soil factors other than those used in our soil potential ratings (permeability, soil drainage, runoff, flooding and available water) should be considered in making application rates and schedules for defined cropping systems (ie, organic matter content, depth to bedrock

4.

5.

6.

7.

Table 1. Information Used For Waste Management Guidelines

State	Source	Soil Properties Considered	Rate of Application
Ohio	Ohio Livestock Waste Management Guide	None	Nitrogen applied should not exceed crop utilization (See Agronomy Guide)
Ohio	Land Application of Sewage Sludge	Slope, depth to bedrock or sands and gravel, water table, pH, CEC, organic matter, flood hazard, phosphorus retention, texture, structure, permeability, drainage, erodibility	Sludge analysis, soil analysis, crop information (See Agronomy Guide)
South Dakota	Manure Use in Cropping	None	
General	Animal Waste Utilization on Cropland		

SITE SELECTION AND MANAGEMENT

The primary reason for applying sewage sludge on agricultural land is to utilize the nutrients in sludge for crop production while minimizing the environmental objections of sludge disposal.

Consideration must be given the crop to be grown and its nutrient requirements, along with those soil and landscape characteristics which determine the ability of agricultural land to receive sludge in an environmentally safe manner.

Crop utilization of sludge nutrients with minimal environmental risk can be achieved if: (1) rates of sludge application are tailored to the nutrient requirements of the crop and the physical features of the site and (2) metals added to soil in sludge do not exceed the guidelines discussed later (See "Excess Heavy Metals" section). In most cases, annual rates of sludge application will be less than 5 dry tons per acre. At these rates, environmental risk is minimul. The soil's ability to safely handle sludge decreases as the application rate increases above the 5 dry tons per acre rate. Higher rates can be applied on some soils if managed more extensively and monitored closely.

Soil and landscape characteristics which must be considered for sound management of land application of sludge are discussed below. County soil survey reports prepared by the Soil Conservation Service (SCS) and the Division of Lands and Soils, Ohio Department of Natural Resources and farm plans prepared by SCS and Soil and Water Conservation District (SWCD) personnel for individual farms contain much of the pertinent soil and landscape data discussed in the next section. The county soil survey reports have been completed for much of Ohio. They are available from SCS, SWCD and county Extension offices..

Landscape Features

Slope

Sludge should not be spread on slopes greater 'than 12 percent. On 6 to 12 percent slopes, sludge should be spread only when: (1) at least 80 percent of the soil is covered with vegetation, (2) immediate incorporation or injection is possible, or (3) erosion control practices meet recommendations in the "Ohio Erosion Control and Sediment Pollution Abatement Guide," Cooperative Extension Service Bulletin 594.

Proximity to Water

When the application rate is less than 2 dry tons per acre, sludge may be spread up to 25 feet from ponds, lakes, streams or drainage ditches. It may he spread at rates less than 5 tons *per acre* without incorporation on level ground where there is a berm or vegetative harrier between the field and the pond. lake, stream or ditch. At rates greater than 5 tons per acre, sludge should not be spread within 300 feet of ponds, lakes, streams, or drainage ditches unless incorporated immediately. A distance of 25 feet should be maintained from swales and small surface ditches in a closed landscape, i.e., no direct drainage to a pond, lake or drainage ditch, regardless of rate.

Flood Hazard

Sludge should not be applied to soils subjected to more than a 10 percent chance of flooding per year.

Shallow Soils

Sludge application rates of 5 dry tons per acre or less are recommended for soils less than five feet thick overlying fractured bedrock **or permeable sands or gravels. Relatively low application rates are recommended because of the potential leaching of soluble sludge components into groundwater. Shallower fine textured soils may be used with lower application rates.**

Water Table

Application of sludge in excess of 2 dry tons per acre is not recommended when a perched water tahle is within a foot of the surface. On very poorly drained soils, sludge application rates should be restricted unless adequate **surface *or* tile** drainage is pmvided.

Seepage

High rates of sludge application should he avoided on land with pronounced lateral seepage.

Soil Properties

Chemical Properties and Soil Testing

Standard soil tests should be made prior to sludge **application** so growers can determine the nutrients that will be available from the soil. Composited soil samples for this test should represent no *more* than 20 acres. **These tests consist of pH, cation exchange capacity, lime test index, available phophorus, exchangeable** potassium, calcium and magnesium.

Soil **pH and cation exchange capacity (CEC) are used to determine safe levels of heavy metals which can be added in sludge (See "Excess Metals" section).** Standard soil tests are run by the REAL soil test laboratory at the Ohio **Agricultural Research** and **Development Center at Wooster, and by a** number of **private laboratories within the state. A bulletin on proper soil sampling technique is available fmm county Extension offices.**

Some recommendations concerning the tests are as follows:

pH: The pH of the plow layer (0-8″) should be 6.5 or greater. Plants will accumulate more heavy metals from a soil with a pH less than 6.5.

Cation Exchange Capacity **(CEC):** Soils with higher cation exchange capacities have greater ability to hold and immobilize heavy metals. Table

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COMMITTEE 8

CLASSIFICATION, INTERPRETATION, AND MODIFICATION OF SOILS ON MINE SPOILS AND DISTURBED SOILS

Charges for this committee were:

1. Provide a summary of work completed or beidg conducted in classifying mine spoils, tailings, wastes and other disturbed materials. Include reports on performance of materials already classified.

2. Provide a summary of work done in the modification of mine spoils, tailings, wastes, and other disturbed materials that resulted in improving them as a better medium for growing plants.

3. Identify methods needed or used to reconstruct soils according to present guidelines for reclamation in surface mining with particular emphasis on soils qualifying as prime farmland.

Summary of Responses to Charge 1

Illinois

Three soil surveys are underway in counties where extensive surface mining has occurred and is still very active. At this time plans are to use three series. One series in a skeletal family from Ohio will be used. Two others are being proposed - one for old spoil in fine-loamy, mixed (calcareous), mesic Typic Udorthents and one for recently reconstructed soil in the fine-silty, mixed, mesic Entic Hapludolls. May have to propose a Mollic Udorthents.

The last report also indicated Ivan Jansen began a five-year study to characterize mine spoil materials. He has data from 1978 and 1979.

Work so far has dealt with variability and perception of order (geographic patterns) in soil properties on reclaimed lands. Soils constructed on the post mine landscape were found to be variable, but much of that variability could be attributed to geologic materials at the site, mining methods, and/or reclamation methods. Considering these factors it was possible to delineate bodies of soils in such a way that most of the variability was among units and the units were as homogeneous within as is common with undisturbed soils..

A reasonable conclusion is that soil variability on reclaimed land does contain orderly patterns that can be perceived and mapped. The mapped soils can be sufficiently homogeneous for classification at the series level. Studies indicate that reconstructed soils from reasonably uniform overburden materials are sufficiently uniform for soil series to be established and mapped. Older mine spoils appear to be much less compacted than those in which wheel spoils have been graded or in those in which root medium had been scrapper-hauled. The older spoils even if in the same textural family probably should be mapped and classified separately because of lower bulk densities.

Corn and soybean performance on constructed soils at five sites are based on only one to two years data. We should not attempt to draw firm conclusions 'on such meager data, but current trends may be of interest.

Both corn and soybeans performed much better on mined land in 1979 than in 1978. The following was observed. Corn yields ranged from 20 bushels/acre for the poorest treatment to 191 bushels/acre for the best treatment (irrigated) on mined land in 1979. Soybeans ranged from about 10 bushels/acre to 41 bushels/acre. Early season appearance of corn was better on the topsoil than on the spoil on all sites again in 1979, though the contrast was not nearly as great on those sites that were going into their second year of rowcrop production. Corn on first year spoil shows phosphorus deficiency symptons. Lack of mycorizza first year is tied to this deficiency. It is not a problem for the second year of corn.

Michigan

Disturbed materials are mainly from mining of iron, gypsum, limestone, and copper. Except for copper, mining is open pit. Sampling for characterization has been done by age of waste and year of vegetative stabilization. Laboratory results are not complete but preliminary data indicates that each kind of waste differs within the basins where it is deposited as well as between mine sites. Because wastes are placed in basins by water, textural families range from sandy to fine-silty. Mineralogy reflects the kind of ore mined.

Missouri

There has been limited work in classification and interpretation of disturbed materials in Missouri. One series report in 1978 is being used in the thermic zone for mine spoil. A series established in Ohio is being tested in a survey in the mesic zone. Two series have been established and correlated for disturbed soils in urban areas.

North Dakota

Areas of old unmodified spoil have been classified as mine pits and dumps and more recently as Ustorthents. Areas of abandoned mine land is small and few areas have been reclaimed.

Ohio

Of five soil series proposed in 1977 for mine spoils, four have been established and one is tentative. One or more of the series are being tested in seven survey areas. Each series has a reclaimed phase and one has a stony phase. Use of the soils is predominantly for pasture and hay crop. Some wheat is grown. Yields developed for the interpretation record have turned out to be realistic. Little other performance data is available.

Summary of Responses to Charge 2

All members report studies and research projects underway but the data base is still small. Most of the work is being measured through vegetative response. In Illinois there is some indication yields can be improved by replacing claypan subsoil with underlying material. Topsoil replacement on spoil in general results in higher yields than on non-topsoiled spoil. Irrigation appears to cause a significant increase in yields. Studies in North Dakota indicate the most successful practice has been the placement of A horizon, B horizon, and in some cases C horizon over saline and/or sodic spoil. There is a potential for upward migration of sodium and more study is needed.

Summary of Responses to Charge 3

In Illinois plot studies evaluating such practices as topsoiling and B horizon replacement are not conclusive enough yet to make recommendations to reconstruct soils. It is known that favorable bulk densities are difficult, if not impossible, to achieve with scrapper-hauled or wheel spoil rooting medium with present reclamation methods.

Technical guide materials have been developed in most states for use in making recommendations for reclaiming disturbed soils. Most of these are being tested mainly in relation to the Rural Abandoned Mine Program.

North Dakota reported a complex of small areas of prime farmland in larger areas of non-prime lands will be a problem in reclamation under Public Law 95-87 unless a size limitation is placed on the area of prime land that must be restored. Reclamation under the federal act has not taken place on new mining yet.

Topics suggested for the committee to discuss at the conference included:

1. Effectiveness of present vegetative methods to control erosion.

2. Application of the Universal Soil Loss Equation on disturbed soils.

3. Rural Abandoned Mine Program in relation to plan development, types of borrow material, and efforts to overcome toxic drainage.

4. Guide for rating drastically disturbed soils.

Those attending the committee meeting discussed the fact that sloping mine spoil and disturbed soils seem to be very susceptible to erosion. Rills and gullies form easily even in vegetated areas.

The feeling is that use of the Universal Soil Loss Equation in the planning of erosion control systems is limited by lack of data assigning an erodibility factor (K factor) to disturbed soil material.

We also saw some pictures of problems encountered in planning reclamation of rural abandoned mine land. Procedures being used in plan development were briefly reviewed.

The guide for rating drastically disturbed soils in the National Soils Handbook has had very limited use.

As a result of our discussions. the committee has the following recommendations:

1. Committee 8 be continued and that they,

2. follow-up on the development of K factors for disturbed soils,

3. Consider compaction problems associated with surface mine reclamation.

4. Continued to summarize work being done in the modification of mine spoils, and other disturbed materials that results in improving them as a better medium for growing plants and evaluate performance of reconstructed soils.

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